ARTIFICIAL ARITHMETICK IN DECIMALS:

Shewing the Originall, Ground, and Foundation thereof: With the Quinteſſence of the GOLDEN RULE, the true valuation of all *Annuities*, and ſolution of all difficult *Queſtions* of that nature.

Alſo to finde a Diſtance at one Station, an Art never till of late invented, and not till now Publiſhed.

Together with diverſe Uſes and Applications thereof, very uſefull and neceſſary for Gunners, Sea-men, *and* Surveyors of Land.

By ROBERT JAGER, Gent.

Infœlix, cujus nulli ſapientia prodeſt.

LONDON:

Printed by *Robert* and *William Leybourn*, for *Humphrey Moſeley*, and are to be ſold at his Shop in St. *Pauls* Church-yard, at the ſigne of the Princes Arms: *MDCLI.*

BIBLIOTHECA BODLEIANA

To The READER:

Courteous Reader:

Ere is presented to thy view, an exact and compendious form of *Artificiall Arithmetick*, performed all by Tens or *Decimals*, in which, all the intricate and tedious re-

ductions of Fractions, commonly uſed in Vulgar or Naturall Arithmetick are wholly avoyded, and taken off as of no uſe; and any Queſtion, of what nature ſoever, may be hereby reſolved by whole Numbers only, whether it be converſant about either Money, Weight, Meaſure, Time, intereſt, Annuities, Barter, Exchange, Loſſe, Gaine, Fellowſhip, &c.

Therefore taking into con-

conſideration the common way of *Naturall Arithmetick*, and finding it to be tedious and prolix, God in his mercie towards me, directed me to this way, which thou wilt finde to be very ready, acute, and exact, working that at one operation, which by the common way you muſt make four or five works of. And, therefore, I thought good to expoſe it to publique view, for the better di-

directing thee in the readi-
eſt and exacteſt way of *A-
rithmetick* that can poſſibly
be invented, which I hope
thou wilt approve of, and
gain experience by

Herein the *Merchant* may be fully ſatisfied of the worth or value of any foreign *Coyn* in *Engliſh money*, and upon any *gain* or *loſſe* in any *commodity*, may exactly compute his *profit* or *diſadvantage*, with far more facility (and altogether as much

much exactneſſe) as by any way heretofore practiſed.

The *Tradeſ-man* or *Artificer* may herein be *copiouſly* furniſhed with the *Quinteſſence* of the *Golden Rule* in all his ſeverall varieties, either *Direct* or *Retrograde*; *Single* or *Double*, with the *converſion* or *alteration* thereof according to the tenor of the *Queſtion* propounded.

The *Cannoneer* or *Gunner*, as alſo the *Practicall* Ge-

Geometrician may herein receive abundance of ſatisfaction, in finding the *Weights* and dimenſions of ſeveral *Figures* and *Metals*, as of *Squares*, *Spheares*, *Circles Pyramids*, *Parallelograms*, &c.

Should I inſiſt upon all the uſes that this *Treatiſe* is aſſiſtant to, I ſhould ſooner want *words* then *matter*, the *uſes* thereof being as many, as every mans *practiſe* or *occaſion* can require, ſo that

To the Reader.

I ſhould ſoone *exceed* the *bound* of a *Preface.*

And thus, wiſhing *thee* all *Health* and *Happineſſe*, I commit *thee* to *Gods Sacred Protection*, and reſt,

Thy reall Friend,

ROBERT JAGER.

THE CONTENTS:

1 Inteen Rules for direction and iutroduction ineo this Artificiall Arithmetick. 1

2 Numeration. 48

3 Addition. 49

4 Subſtraction. 57

5 Multipltcation. 65

6 Diviſion. 71

7 The Rule of Three Direct. 85

8 The Backward Rule of Three. 96

9 The Double Rule of Three. 103

10 The double Rule of Three wrought backwards. 111

11 The Rule of Three after a Duplicated proportion. 112

12 The Backward Rule of Three after a Duplicated proportion. 114

13 The

13 *The rule of Three after a triplicated proportion.* 116

14 *The Rule of Practiſe by Multiplication only* 118

15 *The rule of Practiſe by Diviſion only, having* 1 *in the ſecond place.* 124

16 *The rule of Practiſe by Diviſion only, having* 1 *in the third place.* 128

17 *The rule of Proportion conteining theſe five Uſes.* 132

Firſt, *To finde what any ſum of money, to be paid at the end of* 1,2,3,4,5, *or more years, with uſe upon uſe, will increaſe unto.* 133

Secondly, *To finde what any ſum of money to be paid at the end of* 1,2,3, 4,5, *or more years, abating uſe upon uſe, will decreaſe unto.* 141

Thirdly, *To finde the preſent worth of* 100 lib. *or any other ſum of money, to be paid at the end of* 20 *yeares, or any ſhorter time.* 149

Fourthly, *To find in how many years* 100 lib. *or any other ſum will be paid by* 8 li. *or any other ſum by the year, allowing uſe beſides* 152

Fifthly,

Fifthly, *To finde the true and perfect worth of any Office, Leaſe, Yearly Penſion or Annuity, to continue for any term of years, and the ſolution of all difficult Queſtions of that nature.* 158
18 *Fellowſhip in Gain.* 170
19 *Fellowſhip in Loſſe.* 177
20 *Fellowſhip in Time.* 183
21 *Equation of Payments in time.* 188
22 *Equation of payments preſent or without Time.* 191
23 *Tare.* 207
24 *Gain.* 210
25 *Loſſe.* 216
26 *Barter.* 219
27 *Alligation.* 223
28 *Exchange.* 227
29 *Progreſſion.* 230
30 *Single Poſition.* 235
31 *Double Poſition.* 240
32 *Of taking Diſtances at one Station.* 249

A R-

ARTIFICIALL ARITHMETICK.

INtending to treat of *Artificiall Arithmetick*, I held it convenient first of all to demonstrate what it is, how it works, and the facility and readinesse thereof, in all manner of Arithmeticall operations, excelling Naturall Arithmetick in this, that it useth not Reduction and equalling the *Logarithmes*, in that it may be carryed in memory, and used without the help of a Table (which they cannot) and agreeing with them in exact working both of Whole Numbers and Fractions.

Artificiall Arithmetick therefore is that, which addeth and substracteth, multiplyeth and divideth, whole Numbers and Fractions together, and the Totals and Remainers, Products and Quotients, give the whole Numbers and Fractions without the help of *Reduction*.

more perfectly and readily than naturall Arithmetick doth or can; and in this respect onely it differeth from natural Arithmetick.

The Fractions in this kind of Arithmetick, are of several denominations, as Primes, Seconds, Thirds, Fourths, Fifts, Sixts, &c. *ad infinitum*. And 10 of every one of these denominations, make 1 of the precedent numbers. As,

10 Seventhes		Sixt
10 Sixts		Fift
10 Fifts		Fourth
10 Fourths	make 1	Third
10 Thirds		Second
10 Seconds		Prime
10 Primes		Unit, whether the

Unit be 1 Pound, 1 Yard, 1 Ell, 1 Acre, 1 Perch, or Rod, 1 Foot, 1 Inch, 1 Hundred weight, 1 Year, 1 Moneth, 1 Houre 1 Minute, 1 Second, or 1 Ounce, for all these, and such like, are expressed in artificiall Fractions, as the parts of a Pound.

And

And note that,

	of 1 pound	sh.	d.	is thus expreſſed.
1/32		00	7 1/2	 031250
1/16		1	3	 0625
1/8		2	6	... 125
1/4		5	0	.. 25
1/5		4	0	. 2
1/3		6	8	 333333
3/4		15	0	.. 75
3/4 & 1/2 a quarter		17	6	... 875

And what is ſaid here for expreſſing the parts of a pound, muſt be underſtood likewiſe for expreſſing the parts of any Unit, whether Yard, Ell, Acre, Perch, Foot, Inch, Hundred Weight or any other.

But to expreſſe other parts of a pound, as 1/20, 1/100, or ſuch like, or the parts of a ſhilling, then make uſe of theſe two Tables, hereunto adjoyned, which it is neceſſary to get by heart, and keep in remembrance.

And for the ful and true underſtanding of this *Artificiall Arithmetick*, theſe enſuing Rules are likewiſe to be obſerved and remembred.

The Table of the parts of a ſhilling from 1 farthing to 11 pence 3 farthings.

	q.	Primes.	Seconds.	Thirds.	Fourths.	Fifths.	Sixths.	Sevenths.
		.	.	.	.	.	.	.
	1	00	1	04	17			
	2	00	2	08	34			
	3	00	3	12	5			
d								
1	2	00	6	25				
3	0	01	2	5				
6	0	02	5					
9	0	03	7	5				

The Table of the parts of a Pound, from 1 ſhilling, to 19 ſhillings in Primes and Seconds.

ſh.	. .
1	05
2	1
3	15
4	2
5	25
6	3
7	35
8	4
9	45
10	5
11	55
12	6
13	65
14	7
15	75
16	8
17	85
18	9
19	95

1 *The uſe of the Tables in expreſſing or ſetting down Fractions.*

THeſe Tables ſerve inſtead of *Reduction*, to expreſſe the parts of a pound or ſhilling in artificial numbers; as if you were to ſet down 3 ſhillings, 8 pence, 3 farthings, as in the firſt Example; or 9 ſhillings, 5 pence 2 farthings; as in the ſecond Example. Look in the Table of the parts of a pound (if you have it not by heart) firſt, for 3 ſhillings, and over againſt it, you ſhal finde 1 prime 5 ſeconds, the artificiall numbers expreſſing 3 ſhillings: and in the table of the parts of a ſhilling, look firſt for 6 pence, then for 1 penny 2 farthings, then for 2 farthings twice, and laſtly for 1 farthing, and over againſt every one of them, yon ſhal finde their artificial numbers. Deal ſo likewiſe with the ſecond Example, and having placed each denomination under other, as primes under primes, ſeconds under ſeconds, and thirds under thirds, &c. adde them together, and the total wil give you your deſire, as in the Examples.

1 *Example.*

..
15.
025
00625
0020834
0020834
0010417

..... .
1864585

2 *Example.*

1.
.45
0125
00625
0020834
0020834

..... .
4729168

And although ſometimes the Fractions be ſo ſmal, that there is neither primes nor ſeconds in them, yet ſet Cyphers to keep the places of primes and ſeconds, whereby the reſt that follow, may be known, what denomination they are of, and put pricks over their heads to diſtinguiſh them from whole Numbers: as in the Fraction expreſſing 3 pence, there is no primes, and in the Fraction expreſſing 1 penny 2 farthings, there is neither primes nor ſeconds, yet Cyphers muſt be ſet to keep their places, as both in the precedent Examples, and Tables plainly appeareth.

2 *To finde the half of an Unit, or of any artificiall Fraction.*

OBserve this for a general Rule, that $\dot{5}$ is the half of any Unit, and of any artificial Fraction, whether prime, second, third, fourth, fift, or sixt, &c. as the half of 1 pound, 1 acre, 1 foot, &c. is $\dot{5}$ primes; the half of 1 prime $\dot{5}$ seconds, the half of 1 second is $\dot{5}$ thirds, &c. Likewise the half of $\dot{0}\dot{5}$ seconds is $\dot{0}\dot{2}\dot{5}$ thirds; for the half of 0 is 0, the half of $\dot{5}$ seconds is $\dot{2}$ seconds, & the half of 1 second is $\dot{5}$ thirds, which placed in order, stand thus $\dot{0}\dot{2}\dot{5}$: or divide $\dot{0}\dot{5}$ seconds by $\dot{2}$ adding 1 cypher, and the Quotient wil give you $\dot{0}\dot{2}\dot{5}$ thirds, as before

$$\begin{array}{c} 1 \\ \dot{0}\dot{5}\dot{0}\,(\,\dot{0}\dot{2}\dot{5} \\ 22 \end{array}$$

3 *To set down whole Numbers and Fractions.*

IF you be to set down Fractions with whole Numbers, as 9 pounds, 7 shillings, 11 pence, 3 farthings; or 24 pounds, 10 pence, 2 farthings: or divers summes together, first pul down

down your whole Numbers each denomination under other, as uuits under units, tens under tens, hundreds under hundreds, &c. then your Fractions, primes under primes, ſeconds under ſeconds, &c. And having added them together, draw a prime line, and prick your Fractions to diſtinguiſh them from whole numbers: and then they are ready for any operation, whether *Multiplication*, *Diviſion* or *Subſtraction*: as in the firſt, ſecond and third examples.

And if you be to ſet down any ſummes in natural Arithmetick, place likewiſe each denomination under each, as pounds under pounds, ſhillings under ſhillings, pence under pence, &c. as in the fourth example.

1 *Example.*

9|35
073
00625
0020834
0020834
0010417

9|3989585

2 *Example.*

24|0375
00625

24|04375

3 *Example.*

27	6875
19	7625
172	575
1932	8
2153	8250

4 *Example.*

lb	ſh.	d	q
16	19	11	2
33	14	3	3
140	9	7	0
1157	18	6	3
1349	02	5	0

4 *To finde the Numerator, and Denominator of a Fraction.*

THe onely cauſe of producing a Fraction is *Diviſion*: The figures above the line, are called the Numerator, and the figures under the line the Denominator. *Example.*

193 *Numerator.* 225 *Numerator.*

1000 *Denominator.* 475 *Denominator.*

5 *To finde the artificiall Numbers of a Fraction.*

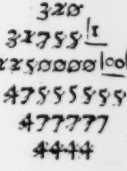
ADde 5 or more cyphers to the Numerator, then divide by the Denominator, and the Quotient wil give you the artificial Numbers.

Ex-

Example.

225 *Numerator the Dividend.*

475 *Denominator the Diviſor.*



6 *To finde the true value of any Fraction.*

THere are divers ſorts of Fractions, as fractions expreſſing the parts of a pound, and ſuch is the fraction $\dot{4}7\dot{3}6\dot{8}4$ before found: fractions expreſſing the parts of one hundred weight, and ſuch is $\dot{8}5\dot{9}0\dot{9}$; Fractions expreſſing the part of a Moneth in dayes and hours, and ſuch are $\dot{6}6\dot{6}$, $\dot{4}\dot{4}1\dot{7}$, and $\dot{3}1\dot{4}$; Fractions expreſſing the parts of an hour in minutes and ſeconds, and ſuch are $\dot{6}4\dot{7}$, $\dot{5}\dot{5}2\dot{2}$; Fractions expreſſing the parts of a minute in ſeconds and thirds;

thirds; and ſuch is 7272 : Fractions expreſſing the parts of an acre of land in perches, and ſuch is 825: and divers others.

To finde the value of the firſt ſort of theſe Fractions, being in coyn, multiply it firſt by 20, the ſhillings in one pound, then multiply the remainer by 12, the pence in 1 ſhilling, and laſtly, multiply that remainer by 4, the farthings in 1 penny, and the ſeveral products wil caſt over the prime line, the ſhillings, pence, and farthings conteined in that artificiall fraction, and the remainer is the parts of a farthing: as in the firſt example.

Likewiſe multiply 85909 by 112 the pounds in 1 hundred weight, and it wil give on the left hand the prime line, the pound weights therein conteined, and the figures on the right hand are the parts of a pound, as in the ſecond example.

In like manner, multiply 666, 4417, 314, 62, by 30 the days in one moneth, and the products wil caſt over the prime line, the days conteined in thoſe Fractions, and the remainers the parts of days, as in the third, fourth, fift, and ſixt examples.

Alſo

Alſo multiply 647. 5522. and 7272 by 60. the minutes in one hour, and ſeconds in one minute, and thirds in one ſecond (for as every hour conteins 60 minutes, ſo every minute conteins 60 ſeconds, and every ſecond, 60 thirds, and every third, 60 fourths, &c.) and the ſeveral products wil caſt over the prime lines, the minutes, ſeconds and thirds, conteined in thoſe Fractions, as in the ſeventh, eight and ninth examples appeareth.

And to finde the content of any Fraction, leſſe then 1 pound weight, if it be of any wares or merchandize garbleable, as Sugar, Pepper, Cloves, Mace, Currants, Wool, and ſuch like, multiply it by 16, the ounces in 1 pound. But if it be of wares or merchandize not garbleable, as Gold Silver, Plate, Bread, and ſuch like, then multiply it by 12, the ounces in one pound, and the products wil give you the ounces in ſuch remainers or fractions.

Example

1 *Example.*

473684
20

Shillings 9|473680
12

947360
473680

Pence 5|6841 60
4

Farthings 2|7|36640

2 *Example.*

85909
112

171818
85909
85 909

Pounds 96|21808

21808
16

130848
21808

Ounces 3|48928

3 *Example.*

666
30

Dayes. 19|980

980
24

3920
1960

Hours. 23|520

4 *Example.*

4417
30

Dayes. 13|2510
24

10040
5020

Hours. 6|0240

5 Example.

314
30

Dayes. 9|420
24

1680
840

Hours. 10|080

6 Example.

62
30

Dayes. 18|60
24

240
120

Hours. 14|40

7 Example.

647
60

Minutes 38|820
60

Seconds 49|200

8 Example.

5522
60

Min. 33|1320
60

Sec. 7|9200

9 Ex-

9 Example.

7272
60

Secõds 43|6320
60

37|9200

10 Example.

825
160

49500
825

Perches 132|000

7 Another way to finde the value of any Fraction, expreſſing Coyn.

IT is manifeſt, by the precedent Table, expreſſing the parts of a pound in primes and ſeconds, that 1 prime is 2 ſhillings, 2 primes 4 ſhillings, &c, and likewiſe that 5 ſeconds is 1 ſhilling. But if the figure ſupplying the place of ſeconds, be under, or leſſe than 5, as 4,3,2,1 then it ſtands but for ten times ſo many farthings, as the value of the figure is, as 4 ſtands for 40 farthings, 3 for 30, 2 for 20, and 1 for 10. Again, if the figure ſupplying the place of ſeconds, be above or more than 5, as 9,8,7,6, then ſubſtract 5 from them, and the remainer ſtands for ten times ſo many farthings, as aforeſaid.

Note

And you muſt note that all numbers in ſeconds and thirds, not exceeding 24, are a juſt number of farthings, if they exceed 24, caſt away 1, and the remainer is a juſt number of farthings, and that all Figures in any fraction after thirds are but parts of a farthing, for though they be all figures of 9, yet they will want ſomething of a farthing, though it be a thing not conſiderable.

Theſe things premiſed, conſider what primes, ſeconds, and thirds, you have in any fraction expreſſing the parts of a pound or ſhilling, as if you have 6 primes, 6 ſeconds, 2 thirds, then you may ſay, that they are in Coyn, 13 ſhillings, 3 pence, for 6 primes is 12 ſhillings, and 5 ſeconds ſubſtracted from 6 ſeconds is 1 ſhilling, and 1 ſecond remaining, and 2 thirds, are 12 farthings, which is 3 pence, ſo the whole is 13 ſhillings, 3 pence as before.

Again, if you have 9 primes, 9 ſeconds, 8 thirds, then you may ſay, that they are in coyn 19 ſhillings, 11 pence, 3 farthings, for 9 primes is 18 ſhillings, and 5 ſeconds from 9 ſeconds, is 1 ſhilling, and 4 ſeconds remaining, and 8 thirds are 48 farthings, from which, becauſe it exceeds 24, caſt away 1, reſt 47 farthings, which is 11 pence 3 farthings, and the whole 19 ſhillings, 11 pence, 3 farthings, as before: and ſo of others as in theſe examples.

19 ſhillings

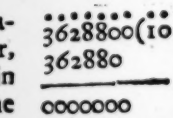
9989584	19 ſhillings, 11 pence, 3 farthings.
8885417	17 ſhillings, 9 pence, 1 farthing.
6666664	13 ſhillings, 4 pence.
453125	9 ſhillings, 3 farthings.
0166668	4 pence.
0041664	1 penny.

8 *To finde the true value of a Fraction of Fractions.*

ADmit you meet with any ſuch Fractions as theſe, *videlicet*, $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{4}{5}$ of $\frac{1}{3}$ of $\frac{6}{7}$ of $\frac{7}{8}$ of $\frac{8}{9}$ of $\frac{9}{10}$ of a pound: Or $\frac{3}{12}$ of $\frac{15}{16}$ of a Yard. Multiply all the Numerators or Remainers in themſelves, and the product ſhall be a new Numerator, likewiſe multiply all the Denominators in themſelves, and the product ſhall be a new Denominator. Then adde Cyphers to the Numerator, and draw a prime line, and divide by the Denominator, and the Quotient will give you the value of the Fraction, as in the examples.

3	2
1	4
3	8
2	3
6	24
4	5
24	120
5	6
120	720
6	7
720	5040
7	8
5040	40320
8	9
40320	362880 *New Denominator.*
9	
362880 *New Numerator.*	

Now divide this new Numerator, by the new Denominator, and the Quotient will be 10, in coyn 2 ſhillings, and ſuch is the content or worth of the Fraction.



Thus

15	360)	45000(125
3		360
45 *New Numerator.*		900
		720
18		1800
20		1800
360 *New Denominator.*		0000

Thus likewiſe the value of the ſecond Fraction is found to be $\frac{1}{4}$ a quarter of a Yard.

9 *To ſet down irregular Fractions in artificiall Numbers.*

I Call thoſe irregular Fractions, which cannot be ſet down by the parts of a pound or ſhilling, as $\frac{1}{48}$ part of a pound, $\frac{1}{36}$ part of a pound, 17 dayes of a Moneth, 23 pounds weight, 8 pounds weight, and ſuch like: For none of theſe, or any ſuch irregular Fractions, are to be found in the ſaid Tables, or can be ſet down by the ſame. Therefore the artificiall Numbers for theſe and ſuch like are to be found by *Diviſion*; For divide 1 pound, adding Cyphers, by 48, and likewiſe by 36, and the ſeverall Quotients will give you their artificiall Numbers, as in the firſt and ſecond examples.

In like manner, divide 17 dayes, adding cyphers by 30, and the Quotient will give you the artificiall Numbers thereof, as in the third example,

Also divide 23 pounds weight by 112, and the Quotient will give you the artificiall Numbers of that Fraction, as in the fourth example.

Likewise divide 8 pounds weight by 112, and the Quotient will give yon the artificiall Numbers answering thereto, as in the fift Example,

1 *Example.*

48)1|000000(0|020833
96
400
384
160
144
160
144
16

2 *Example.*

36)1|000000(0|02777
72
280
252
280
252
280
252
28

3 *Ex-*

3 *Example.*

```
30) 17,0000(0,5666
    150
    ----
     200
     180
    ----
     200
     180
    ----
     200
     180
    ----
      20
```

4 *Example.*

```
112) 23,00000(0,20535
     224
     ---
      600
      560
     ----
      400
      336
     ----
      640
      560
     ----
       80
```

5 *Example.*

```
112) 8,000000(0,071428
     784
     ---
      160
      112
     ----
      480
      448
     ----
      320
      224
     ----
      960
      896
     ----
       64
```

10 *To adde Numbers together.*

IN *Addition* of Numbers, if the totall of the Sixths, or the laſt Figures in the Fraction, of what denomination ſoever they be, being added together, amount to 10 or more, ſet down a Cypher, or the exceſſe above 10, to keep the place of Sixts, and carry 1 to Fifts. If it amount to 20, 30, or 40, &c. (as if divers Fractions be added together it may) then carry 2, 3, or 4, to fifts, or the next place what ever it be, and ſet down a Cypher, or the exceſſe above 20, 30, or 40, in the place of ſixts, or what other place it be: Deal ſo likewiſe with all the other Fractions, as in the examples appeareth.

Pounds	*Parts*
32	959375
27	040625
60	000000

Pounds	*Parts*
63	575
59	0375
122	0125

11 *To finde the whole Numbers in Multiplication.*

IF you multiply whole Numbers, by whole Numbers onely, then the Product is all whole Numbers, as in the firſt example. But

But if you multiply whole Numbers and Fractions by whol Numbers only, as in the ſecond example: Or whol Numbers & Fractions by whol Numbers & Fraction, as in the third example: Or whole Numbers and Fractions by Fractions onely, as in the fourth example; Or whole Numbers onely, by Fractions, as in the fift example, then as many Fractions, as you have, both in the Multiplicator and Multiplicand, ſo many Figures in the Product, cut off with a prime line, and the figures on the left hand the prime line (if any be) are the whole Numbers, and thoſe on the right hand Fractions.

1 *Example.*

132
19

1188
132

2508

2 *Example.*

16,0125
2|125

800625
320250
160125
320250

34026|5625

3 *Ex-*

3 *Example*

8|0375
7|25
401875
160750
562625
58|271875

4 *Example.*

25|225
75
126125
176575
18|91875

5 *Example.*

15
4
|60

12 *To multiply by an Unit.*

Multiplication by an Unit, as 10, 100, 1000, 10000, &c. is performed by adding as many Cyphers to the Multiplicand, as belongs to the Unit.

If your Multiplicand be whole Numbers onely, adde the Cyphers to it, and the work is done, as in the first example.

If

If it be whole Numbers and Fractions, then having added the Cyphers, as before, cut off with a prime line as many Figures with the Cyphers, as there are Fractions in the Multiplicand, and the work is finiſhed, as in the ſecond example.

But if the Multiplicand be Fractions onely, then having added the Cyphers, cut off with a prime line, ſo many Figures with the Cyphers as there are Fractions in the Multiplicand, and the Figures on the left hand the prime line, are whole Numbers, and thoſe on the right hand Fractions, as in the third example.

And if it happen, that a Cypher ſupply the place of Primes, where the Multiplicand is Fractions onely, then know, that that Cypher is of no validity, nor ſignifies any thing, as by the fourth example appeareth.

1 *Example.*

614579 *Multiplicand.*
100 *Multiplicator.*

61457900 *Product.*

2 *Example*

49|475 *Multiplicand*
100 *Multiplicator*

4947|500 *Product.*

3 *Ex-*

3 *Example.*	4 *Example*
16875 *Multiplicand.*	03125 *Multiplicand*
100 *Multiplicator.*	1000 *Multiplicator*
16|87500 *Product.*	031|25000 *Product.*

13 *To divide by an Unit.*

DIvision by an Unit, as 10, 100, 1000, 10000, &c. is performed, by cutting off with a prime line, as many whole Numbers from the Dividend, as there are Cyphers in the Unit. And if the Dividend consist but of two whole Numbers beside Fractions, and that there be two Cyphers in the Unit, then cut off the two whole Numbers with a prime line, and turn them all into Fractions, as in the first example.

But if you have not so many Figures in the whole Nnmbers, as Cyphers in the Unit, then to supply that defect, place a Cypher or more, before the whole Numbers, to make them as many as Cyphers in the Unit, and draw a prime line before them, and they will be turned into Fractions, and be the Quotient, as in the second and third examples.

1 *Ex-*

1 *Example.*

	℔	ſh
51|25 *Dividend.*	51	5
100 *Diviſor*		

	ſh	d
|5125 *Quotient*	10	3

2 *Example.*

	℔	ſh	d
45|3375 *Dividend*	45	6	9
1000 *Diviſor*			

	d
|0453375 *Quotient*	11

3 *Example.*

	℔	ſh	d
32|225 *Dividend*	32	4	6
10000 *Diviſor*			

\|00032225 *Quotient* 3 farthings.

14 *To finde how many whole Numbers you ſhall have in the Quotient, when you divide whole Numbers and Fractions by whole Numbers onely.*

WHen you divide whole Numbers and Fractions by whole Numbers onely, you muſt obſerve how often you can find the whole Numbers of the Diviſor, in the whole Numbers of the Dividend, and ſo many whole Numbers you ſhall have in the Quotient, as in the firſt example. And

And having found the whole Numbers of the Diviſor once, in the whole Numbers of the Dividend, and having ſubſtracted and taken down another figure of the whole Numbers, of the Dividend to the Remainer, and cannot finde the whole Numbers of the Diviſor in the Remainer, and the Figure taken down, then place a Cypher in the Quotient to keep the place of whole numbers, and take down the next figure, as in the ſecond example.

Or if after Subſtraction, the Remainer be a Cypher, and the Figure in the whole Numbers to be taken down, be likewiſe a Cypher, yet ſtill put a Cypher in the Quotient to keep the place of whole Numbers; and if there be no more whole Numbers left, then proceed to take down Fractions for the Dividend, as in the third example.

In like manner work, if the Dividend be whole numbers onely, or if the Diviſor be whole Numbers and Fractions.

But if you cannot finde the whole Numbers of the Diviſor, in the whole Numbers of the Dividend, then you ſhall have onely Fractions in the Quotient, and no whole Numbers, yet ſet down a Cypher to keep the place of whole Numbers, as in the fourth example.

And if the prick or laſt figure of the whole Numbers of the Diviſor, fall upon pounds, it will

will bring forth pounds in the Quotient, as in the first, second and third examples.

If it passe pounds, and fall upon primes, it brings forth primes in the Quotient, and no whole Numbers, yet set down a Cypher to keep the place of whole Numbers, as in the fourth example.

Again, if it passe both pounds and primes, and fall upon seconds, it will bring forth seconds in the Quotient, and neither pounds, nor primes, as in the fift example.

But if it passe both pounds, primes, and seconds, and fall upon thirds, it will bring forth thirds in the Quotient, and neither pounds, primes nor seconds, as in the sixt example.

Remember always to set a prick under that figure in the Dividend, as in the examples, upon which the last figure in the Divisor falleth, that you be not mistaken in setting down the Divisor multiplyed, except you use a Table altogether.

And if you be to multiply a Quotient, then divide untill you have six Fractions in it, if it may be.

1 *Example.*

```
27) 32|959375(1|220717
    27
    59
    54
     55
     54
      193
      189
        47
        27
        205
        189
         16
```

2 *Example.*

```
33) 1666|03750(50|48598
    165
      160
      132
       283
       264
        197
        165
         325
         297
          280
          264
           16
```

3 *Example.*

```
25) 1250|3333(50|0133
    125
    ----
    0033
      25
    ----
      83
      75
    ----
      83
      75
    ----
       8
```

4 *Example.*

```
243) 63|7875(0|2625
     486
     ---
     1518
     1458
     ----
      607
      486
     ----
     1215
     1215
     ----
     0000
```

5 *Ex-*

5 Example.

```
375) 22|265625(0|059375
     1875
     ----
      3515
      3375
      ----
       1406
       1125
       ----
        2812
        2625
        ----
         1875
         1875
         ----
         0000
```

6 Example.

```
2256) 3|99375(0|00177
      2256
      ----
       17377
       15792
       -----
        15855
        15792
        -----
           63
```

15 *To divide whole Numbers, by whole Numbers onely.*

WHen you divide whole Numbers by whole Numbers, after the whole Numbers of the Dividend, draw a prime line, and adde 5 or more Cyphers to bring forth the Fraction, if there be any, as in the firſt example.

And if there be no Fractions then the Cyphers ſerve for nothing, as in the ſecond example.

And you may call the Cyphers ſo added primes, ſeconds, thirds, &c. becauſe they ſupply the places of primes, ſeconds, and thirds, &c. and look how often you can finde the whole Numbers of the Diviſor in the whole Numbers of the Dividend, ſo many whole Numbers you ſhall have in the Quotient, as in both the examples appeareth.

And generally in all diviſions, if your Diviſor be greater than the Dividend, and likewiſe to bring forth the Fractions, adde Cyphers at pleaſure.

1 *Example.*

```
44. 567|00000(12|88636.
    44
    ---
    127
     88
    ---
     390
     352
     ---
      380
      352
      ---
       280
       264
       ---
        160
        132
        ---
         280
         264
         ---
          16.
```

2 *Example.*

```
35. 980|00000(28|0000
    70
    ---
    280
    280
    ---
    000.
```

16 *To*

16 *To find how many whole numbers ſhal be in the Quotient when you divide whole numbers and fractions, by whole numbers; and whole numbers onely, by whole numbers and fractions; and likewiſe whole numbers and fractions, by whole numbers and fractions.*

WHen your diviſor conſiſts of vvhole numbers onely, and the dividend of vvhole numbers and fractions, then as often as you can find the diviſor in the vvhole numbers of the dividend, ſo many vvhole numbers you ſhall have in the Quotient, and the reſt vvill be fractions, as in the firſt example.

If your diviſor conſiſt of vvhole numbers and fractions, and your dividend of vvhole numbers onely, the fractions in the diviſor have no part or povver to marke out any vvhole numbers in the Quotient, but looke hovv often you can find the vvhole numbers of the diviſor, in the vvhole numbers of the dividend, ſo many vvhole numbers you ſhall have in the Quotient, as in the ſecond example.

In like manner vvhen you divide vvhole numbers and fractions, by vvhole numbers & fractions, look how many times you can find the whole numbers of the diviſor, in the whole numbers of

the dividend, ſo many whole numbers you ſhall have in the quotient, as in the third example. For as I ſaid before, where whole numbers are both in the diviſor, and dividend, or in one, or either of them, there the fractions in the diviſor, or dividend have no power to marke out any whole numbers in the quotient; but otherwiſe it is where whole numbers, or whole numbers and fractions are divided by a fraction onely, as in the next rule ap-peareth

Excepted alwayes from this generall rule, that if your diviſor conſiſt but of one whole number, and the reſt fractions, and the prime fraction be greater then your whole number, ſo that although you can find the whole number of the diviſor in all the whole numbers of the dividend, yet if you cannot find the firſt, or prime fraction of the diviſor in the ſecond figure of the dividend, you ſhall have one whole number leſſe in the quotient, then there are in the dividend, as in the fourth example plainly appeareth, wherein are foure whole numbers in the dividend, and but three in the quotient.

And ſo it is likewiſe if you have two, or more whole numbers in the diviſor beſides fractions.

1 *Example.*

```
35.  755|5250 (21|5864.
     70
     ---
      55
      35
      ---
      205
      175
      ---
       302
       280
       ---
        225
        210
        ---
         150
         140
         ---
          10.
```

2 *Example.*

```
16|5.  15675|00 (95.
       1485
       ----
         825
         825
         ---
         000.
```

3 *Example.*

3 *Example.*

7|25. 58|271875 (8|0375.

5800

2718
2175

5437
5075

3625
3625

0000.

4 *Example*

4 *Example.*

```
1|33334. 1115|000000000 (836|2458
         1066672
         -------
          483280
          400002
          ------
           832780
           800004
           ------
            327760
            266668
            ------
             610920
             533336
             ------
              775840
              666670
              ------
               1091700
               1066672
               -------
                 25028
```

17. *To divide whole numbers, and whole numbers and fractions, by a fraction.*

FRactions (as is before ſhewed) are of divers denominations, as, Primes, Seconds, &c. There-

Therefore when you are to divide whole numbers onely by a fraction, looke what denomination the firſt figure in your fraction is off, and make your dividend of the ſame denomination, by adding 1, 2, or 3 Cyphers to it; as if it be primes, adde 1 Cypher, and then the whole numbers will be turned into primes, and draw a prime line, as in the firſt example.

If the firſt figure be ſeconds, adde two Cyphers, to make the whole numbers ſeconds, and draw a prime line, as in the ſecond example.

But if the firſt figure be thirds, adde three Cyphers to make the whole numbers thirds, as in the third example.

And if your dividend conſiſt of whole numbers and fractions, then inſtead of cyphers adde of thoſe fractions to the whole numbers, as is before directed, and draw prime lines, as in the fourth, fift, and ſixt examples. And alwayes remember to prick thoſe cyphers, or fractions you adde to the whole numbers to manifeſt what they are.

And note, that thoſe cyphers, and fractions added to the whole numbers as aforeſaid, are reputed for whole numbers, and produce whole numbers in the quotient, as in the ſeverall examples appeareth.

Note alſo, that after the prime line, and likevviſe after the remaining fractions, you adde cyphers

cyphers to bring forth the fractions in the quotient.

1 *Example.*

```
   2
5. 750 (150.
   555
```

2 *Example.*

```
      11|1
     1222|2
    2125555|5
0375. 1700|00000 (454|333
      37555555
       377777
        3333
```

3 *Example.*

```
        335    7|3
      377816650|9
     453014448835|2
    128775888279 9|6
008333. 962000|00000000 (115444|61778
      83333333333333
       833333333333
        8888888888
```

4 *Example.*

```
        1 41
       223307
      10761705|75
425. 5328|625000 (1253|7941.
      4255555555
       42222222
        444444
```

6 *Ex-*

5 *Example.*

025 1803 7500 721|5

175

53
50

37
25

125
125

000

6 *Example.*

00625 47018|75 7523.

4375

3268
3125

1437
1250

1875
1875

0000

18 *To divide a Fraction by a Fraction.*

YOu may plainly perceive by the fourth example in the 11th. rule aforegoing, that if you multiply one or more whole Numbers, by a Fraction onely, and that there are no more Figures in the Product, then in the Multiplicator, the Product will be all Fractions, and no whole numbers.

Now if you be to divide that or any ſuch Product by a Fraction likewiſe, then as in the precedent rule you added Cyphers or Fractions to the whole Numbers, to make them of the ſame denomination, that the firſt Figure in the Diviſor, was off. So in this cut off one, or more of the fractions, with a prime line, to turn them into whole numbers, and to make them of the ſame denomination that the firſt figure in the diviſor is of.

For a further manifeſtation of this rule, we wil take the product in the fourth example of the eleventh rule, and divide it by a fraction: As in the firſt example.

Again, we will multiply a ſum conſiſting of one whole number and a fraction, by a fraction, and the product being all fractions, we wil likewiſe divide it by a fraction, as in the ſecond example.

1 *Example.*

$$\begin{array}{l} \dot{2}.\ \ \dot{6}|\dot{0}\ (3|\dot{0} \\ \quad\ \ 6 \\ \hline \quad\ \ 00 \end{array} \qquad\qquad \begin{array}{r} 2|\dot{5} \\ 15 \\ \hline 125 \\ 25 \\ \hline |\dot{3}\dot{7}\dot{5} \end{array}$$

2 *Example.*

$$\begin{array}{l} \dot{2}\dot{5}.\ \ \dot{3}\dot{7}|\dot{5}\ (15. \\ \qquad\ \ 2\dot{5} \\ \hline \qquad\ \ 125 \\ \qquad\ \ 125 \\ \hline \qquad\ \ 000 \end{array}$$

19 *To find how many whole numbers shall be in the Quotient, when you divide by a Fraction.*

ALthough by adding one or more Cyphers, or Fractions to the whole numbers, you turne the whole numbers into the same denomination that the first figure in the divisor is off.

off. And although you cut off one or more Fractions with a prime line, yet the Cyphers, and Fractions ſo added, and cut off, are eſteemed for whole numbers, and produce whole numbers in the Quotient, as is before declared. And therefore looke how often you can find the firſt figure of the diviſor in the whole numbers of the dividend, ſo many vvhole numbers you ſhall have in the Quotient, as both by the laſt precedent and next followving examples manifeſtly appeareth.

And if a Cypher happen to be in the vvhole numbers, or any figure leſſe then the firſt figure in the diviſor, ſo that you cannot find the firſt figure of the diviſor in it, then put a Cypher in the Quotient to keep the place of vvhole numbers, as in the firſt and ſecond examples.

Excepted alvvayes from this generall rule, that if the firſt figure in the diviſor be leſſe then the ſecond, ſo that although you may find the firſt figure of the diviſor in all the vvhole numbers of the dividend, yet if you cannot find the ſecond figure of the diviſor, in the ſecond figure of the dividend, you ſhall not have ſo many vvhole numbers by one in the Quotient, as are in the dividend. As in the third example.

So likewiſe is it, if the diviſor be greater then the dividend.

1 *Example.*

8 960 (120
8
16
16
00

2 *Example.*

75 75·8333875 (10|111118
75
083
75
83
75
83
75
88
75
137
75
625
600
25

3 *Ex-*

3 *Example.*

18333 | 10|000000000(5|45464

91665

83350
73332

100180
91665

85150
73332

118180
109998

81820
73332

8588

I have ſet theſe Rules together here at the beginning, as the fitteſt place for them, not that I hold it neceſſary for beginners to have them all perfect before they proceed any further, but becauſe they may know, where readily to finde them when occaſion ſhall ſerve, for it muſt be practiſe onely, that muſt make them to underſtand them, and be ready and perfect in them

NU-

NVMERATION.

Numeration (the first part of Arithmetick) expresseth the value of any sum vvhatsoever, and the numbers herein consist of nine figures and a Cypher. To name their values, or hovv much every one of them stand for in their severall places, begin at the right hand; for the first figure next tovvards the right hand is the place of Unites, the next to it of Tennes, the third of Hundreds, &c. Each figure on the left hand exceeding the figure on the right hand ten times, as here follovving appeareth.

Hundreds of Millions	Tennes of Millions.	Millions.	Hundreds of Thous.	Tennes of Thousands.	Thousands.	Hundreds.	Tennes.	Unites.
1	2	3	4	5	6	7	8	9

But to accompt or reckon them, begin at the left hand, and accordingly these nine figures stand for, and expresse, one hundred tvventy three Millions, foure hundred fifty six thousane, seven hundred eighty nine. A D-

ADDITION.

THe uſe of *Addition* is, to bring divers ſummes into one totall, in which reſpect it hath ſome affinity with Multiplication.

1 *Example.*

A Merchant hath four debtors A B C D, A oweth him 1256 pounds. B 797, C 1120, and D 995 pounds; The queſtion is, how much theſe four ſummes amount unto? Anſwer 4168 pounds.

To work this queſtion, or ſuch like, begin firſt with the Units, and adde them together make 18, ſet 8 under Units, and carry 1 to the next place.

Then adde the tennes together, make 25, and 1 you carried makes 26, place 6 under tennes, and carry 2 to the next place.

Again, addthe hundreds together, make 19, and 2 you carried makes 21, ſet 1 under hundreds, and carry 2 to the next place.

Thouſands.	Hundreds.	Tennes.	Unites.
1	2	5	6
	7	9	7
1	1	2	0
	9	9	5
4	1	6	8

Laſtly, adde the thouſands together, make 2, and 2 you carried makes 4, which put under thouſands, and the work is ended. The totall whereof amounts to 4168, which is, four thouſand, one hundred, ſixty eight pounds, as above appeareth.

Example.

A Merchant hath three debtors A B C. A oweth him 332 pounds, 17 ſhillings, 4 pence; B 159 pounds, 6 ſhillings, 8 pence, 2 farthings: and C 217 pounds, 5 ſhillings, 3 pence, 3 farthings. The queſtion is, how much theſe ſums amount unto in the totall? Anſwer 709 pounds, 9 ſhillings, 4 pence, 1 farthing.

lb	*ſh.*	*d.*	*d.*
332	17	04	00
159	06	08	02
217	05	03	03
709	09	04	01

For this work, begin firſt with Farthings, & add them together, make 5 Farthings, which is 1 penny and 1 farthing, ſet 1 under farthings, and carry 1 to pence.

Then adde the pence together make 15, and 1 in mind makes 16, which is 1 ſhilling, 4 pence, place 4 under pence, and carry 1 to ſhilling.

Next adde the ſhillings together, make 28, and 1 you carried makes 29, which is 1 pound,

9 ſhillings, ſet 9 under ſhillings, and carry 1 to pounds, *videlicet* to the place of Unites.

Now added the Unites of the pounds together, make 18, and 1 you carried makes 19, place 9 under the Unites, and carry 1 to tens.

Then add the tens together make 9, and 1 you carried makes 10, ſet 0 under tens, and carry 1 to hundreds.

Laſtly, adde together the hundreds, make 6, and 1 you carried makes 7, which having ſet under hundreds, your work is ended, and the totall is 709 pounds, 9 ſhillings, 4 pence, 1 farthing, as before.

3 *Example.*

A Merchant hath 5 debtors A B C D E, A oweth him 179 pounds, 13 ſhillings, 3 pence; B 63 pounds, 10 ſhillings, 2 pence, 3 farthings; C 19 pounds, 8 ſhillings, 5 pence; D 250 ponnds, 15 ſhillings, 3 farthings; and E 543 pounds, 9 ſhillings, 6 pence, 2 farthings; I demand the totall of theſe ſums? Anſwer 1056 pounds, 16 ſhillings, 6 pence.

lb	*ß*	*d*	*q*
179.	13.	3.	0.
63.	10.	2.	3.
19.	8.	5.	0.
250.	15.	0.	3.
543.	9.	6.	2.
1056.	16.	6.	0.

First add the farthings together, make 8, which is 2 pence, set 0 under farthings, and carry 2 to pence.

Secondly, add the pence together, make 16, and 2 you carry makes 18, which is, 1 shilling, 6 pence, put 6 under pence, and carry 1 to shillings.

Thirdly, add the shillings together, make 55, and 1 you carried makes 56, which is 2 pounds, 16 shillings, place 16 under shillings, and carry 2 to the next place, which is units of pounds.

Fourthly, add together the units of the pounds, make 24, and 2 you carried makes 26, set 6 under the units, and keep 2 in minde.

Fiftly, add the tens together, make 25, and 2 in minde makes 25, place 5 under tens, and keep 2 in minde.

Lastly, add the hundreds together, make 8, and 2 in minde makes 10, set 0 under hundreds, and 1 before it in the place of thousands. And so the work is finished, and the totall amounts to 1056 pounds, 16 shillings, 6 pence, as before.

Hitherto

Hitherto we have wrought Addition according to naturall Arithmetick now we will proceed according to Artificiall. And becauſe the firſt example, being all whole numbers, differs nothing at all in operation by either of theſe kindes of Arithmetick, therefore we will begin with the ſecond Example, and having ſet them down in artificiall numbers according to the third rule, we will add them together according to the directions in the tenth rule.

2 *Example.*

		.....
A.	332	866666
B.	159	335416
C.	217	265625
	709	4077707

Firſt add the ſixths together, make 17, ſet 7 under ſixths, and carry 1 to fifths.

Secondly, add the fifths together, make 9, and 1 you carryed makes 10, put 0 under fifths, and keep 1 in minde.

Thirdly, add the fourths together, make 16, and 1 in minde makes 17, ſet 7 under fourths, and keep 1 in minde.

Fourthly, add the thirds together make 16, and 1 in minde makes 17, place 7 under thirds, and keep 1 in minde.

Fifthly,

Fiftly, add the ſeconds together, make 15, and 1 in minde makes 16, put down 6 under the ſeconds, and keep 1 in mind.

Sixtly, add the primes together, make 13, and 1 in mind makes 14, ſet 4 under primes, and keep 1 in mind; and ſo you have done with the fractions.

Now for the pounds, Firſt, add the unites together, make 18, and 1 in mind makes 19, ſet 9 under the unites, and keep 1 in mind.

Next add the tens together, make 9, and 1 in mind makes 10, ſet 0 under tens, and keep 1 in mind.

Laſtly, add the hundreds together, make 6, and 1 in mind makes 7, which place under hundreds, and the work is done.

Thus by this operation it is manifeſt that the totall is, as before 709 pounds, 9 ſhillings, 4 pence, 1 farthing: For if 4677707 Sixths be multipled according to the ſixt rule, the content will be 9 ſhillings 4 pence, 1 farthing. And according to the ſeventh rule, it will be the ſame, for 4 primes is 8 ſhillings, and 5 ſeconds, taken out of 6 ſeconds is 1 ſhilling, makes 9 ſhillings, and 1 ſecond remayning, and 7 Thirds make 17 farthings, which is 4 pence, 1 farthing; And ſo both ways the true value of this fraction is in coyne, 9 ſhillings, 4 pence, 1 farthing.

Ex-

3 *Example.*

This example added together according to the former directions, makes the totall to be 1056|825000 which by the former rules wil be found to be in coyne 1056 pounds, 16 ſhillings, 6 pence, as before.

	lb	....
A	179	6625
B	63	511458
C	19	420833
D	250	753125
E	543	477084
	1056	825000

I have purpoſely omitted the addition of this example, becauſe I deſire to paſſe over the rules with as much brevity as may be, ſo they be perſpicuous.

Proof. Now for proof, ſubſtract either the firſt or laſt ſum, or any of them from the totall, then add all the reſt together again, that ſum which you ſubſtract onely excepted, and if the totall of the ſecond addition, bring forth the remainer, it is true, elſe not.

We will give examples in both kinds of Arithmetick, and firſt in Naturall, ſecondly, in Artificiall.

2 *Ex-*

2 *Example.*

	℔	ſh	d	q	
The totall is	709	9	1	1	
The firſt ſumme is	332	17	1	0	
The remainer is	376	12	0	1	
The ſecond Addition is	376	12	0	1	*Proof.*

3 *Example.*

	℔		
The totall is	1056	825000	
The laſt ſumme is	543	477084	
Thee remainer is	513	347916	
The ſecond Addition is	513	347916	*Proof.*

SUB-

SVBSTRACTION.

Vbſtraction taketh a leſſer ſum out of a greater, and hath like affinity to diviſion, that Addition hath to Multiplication.

1 *Example.*

A Merchant had owing him 1233 pounds, and hath received in part thereof 975 pounds; I demand how much reſts due? Anſwere 258 pounds.

As in Addition we began at units to bring them into one totall ſum; ſo likewiſe in ſubſtraction we muſt begin at units to finde the remainer.

And as in Addition we carried 1,2,3,or more, to the next place, when the farthings, pence, and ſhillings did amount to 1 peny, 1 ſhilling, 1 pound or more, and likewiſe when the units, tens, hundreds, &c. added together, amounted to 10,20, 30 or more, and ſet down either a cypher, or the exceſſe above 10, 20,30, under units, tens, hundreds, &c. So in Subſtraction, when we cannot take any figure of the money paid, out of the figure juſt over it in the money owing, we borrow 1 or 10 from the next place, and add to it, and out of that totall ſubſtract that figure, in the money paid.

As

As in this example, we cannot take 5, the figure in the place of Units in the money paid out of 3 juſt over, therefore we borrow 1, or 10, of the next place, which added to 3 makes 13, then take 5 from 12, reſts 8, which ſet under 5, and keep 1 you borrowed, in mind.

	lb
Money owing	1233
Money paid	975
Reſt due	258

Secondly, 1 you borrowed and 7 makes 8, take 8 from 3 you cannot, but from 13 you may, reſts 5 which place under 7, and keep 1 you borrowed in mind.

Thirdly, 1 you borrowed, and 9 makes 10, which you cannot take from 2, but from 12 you may, reſt 2, ſet 2 under hundreds, as in the example, and the work is finiſhed, and there will reſt due to the Merchant 258 pounds, as before.

2 *Example.*

A Merchant had owing him 543 pounds, 17 ſhillings, 6 pence, and hath received in part 493 pounds; I demand how much reſts due? Anſwer 50 pounds, 17 ſhillings, 6 pence.

Firſt, begin with pence, 0 out of 6, reſts 6, which put under pence.

Secondly, 00 from 17 reſts 17, which ſet down underſhillings, as in the example.

	lb	ſh	d
Money owing	543	17	6
Money receiv.	493	00	0
Money due	50	17	6

Thirdly, 3 out of 3, reſts 0, place 0 under unites, or 3.

Fourthly, 9 from 4 you cannot take, but 9 from 14 you may, reſts 5, which ſet under 9, and keep 1 you borrowed in mind.

Laſtly, 1 you borrowed and 4 makes 5, which taken from 5 reſts 0, which being a cypher, and of no force there, I put not down; and thus the work is ended, and there reſts due 50 pound, 17 ſhillings, 6 pence, as appeareth.

3 *Example.*

A Merchant lent his friend 1699 pounds, 6 ſhillings, 2 pence, whereof hee hath paid again 1459 pounds, 14 ſhillings, 10 pence: I demand how much reſts due? Anſwer 239 pounds, 11 ſhillings, 4 pence.

	lb	ſh	d
Money lent	1699	6	2
Money repaid	1459	11	10
Reſt due	239	11	5

As formerly ſo now again beginne with pence, 10 frō 2 yon cannot take, but 10 from 12 you may, reſts 2, and 2 makes 4, or 10 out of 14 (for 12 and 2 make 14) reſts 4, which place under 0, and keep 1 in mind.

Secondly, 1 you borrowed, and 14 makes 15, 15 out of 6 you cannot take, but out of 26, you may, reſts 11, which ſet under ſhillings, and keep 1 in mind, for 20 ſhillings and one pound is all one.

Thirdly, 1 you borrowed, and 9 makes 10, 10 from 9 you cannot take, but from 19 you may, reſts 9, or 0 from 9 reſts 9, and carry 1 in mind.

Fourthly, 1 in minde and 5 makes 6, take 6 from 9, reſts 3, which place under tens.

Fifthly, 4 from 6 reſts 2, which place under 4, or hundreds.

Laſtly, 1 from 1 reſts 0, which I put not down for the reaſon before ſhewed: And thus the work is done, and there is yet unpaid 239 pounds, 11 ſhillings 4 pence.

Hitherto we have alſo proceeded in *Subſtraction*, according to naturall Arithmetick, now we

we will work the two laſt examples by artificiall Arithmetick, and that I think will be ſufficient for this rule of *Subſtraction*,, as for the firſt example, there is no difference in the operation thereof by either of theſe ſorts of Arithmetick, therefore we meddle not with it.

2 *Example.*

The manner of *Subſtraction*, being ſo evident by the former examples, vve leave it to practiſe forbrevities ſake, onely mention, that by this artificiall work it appeareth, that notwithſtanding the money received, there reſts due 50|$\frac{875}{\cdots}$ thirds in coyne 50 pounds, 17 ſhillings 6 pence, as before.

	lb	
Money owing	543	$\frac{875}{\cdots}$
Money received	493	000
Reſts due	50	$\frac{875}{\cdots}$

3 *Example*

3 *Example.*

	℔	
Money lent	1699	308333
Money repaid	1459	741666
Reſt due	239	566667

By this operation it likewiſe appeares, that there is yet unpaid 239|566667 Sixths, which in coyne is 239 pounds, 11 ſhillings, 4 pence.

Proof. The proof of Subſtraction is, by adding the money received, or the ſum ſubſtracted, and the remainer together, and if the totall bring forth the firſt ſum, it is true, elſe not.

2 *Example.*

	℔	ſh.	d.
Money owing	549	17	6
Money paid	493	00	0
Reſt due	50	17	6
Proof	549	17	6

3 *Example.*

Money lent	1699	308333
Money repaid	1459	741666
Reſt due	239	566667
Proof	1699	308333

MVLTIPLICATION.

Multiplication is the art to perform that at once, which Addition doth at many times: Herein every figure of the Multiplicand, is multiplyed by every figure in the Multiplicator, and the totall of them all added together is the Product.

1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81

To multiply readily this Table must be got by heart; the use wherof is, to find the product of any unite, or digit multiplyed either by it self, or another. As if you would multiply 9 by 9, look in the square where the two lines from 9 in the side, and 9 in the top do meet, and you shall find 81, and so much is the product.

Again, if you would multiply 6 by 8, look in the side for 6, and in the top for 8; or contrarily, in the side for 8, and in the top for 6, and in both the squares where they meet, you shall fine 48, and such is the product.

If two sums be given to be multiplyed one by the other, you may make, which you wil be the multiplicand, and which you wil the multiplicator, for 20 times 12, and 12 times 20, is all one. But generally for ease in Multiplication, the greater sum is made the Multiplicand, which is always set uppermost, and the lesser the Multiplicator, which is placed under it.

But if two sums of equall numbers be given to be multiplyed, or if one of them be greater then the other by one figure, and end with a cypher, I would make that number ending with a cypher the Multiplicator, and the other the Multiplicand.

1 *Example.*

Eight furlongs, or 320 Rods (every Rod being 16 foot and a half long,) here in *England* is generally eſteemed to be a mile; which being granted, I demand how many feet there are in an Engliſh mile? Anſwer 5280.

The two former Arts, Addition and Subſtraction, we wrought both according to naturall, and artificiall Arithmetick; But in this and the reſt that follow wee wil proceed altogether according to artificiall Arithmetick, for avoiding of Reduction, without which the queſtion propounded, and all others having a fraction in them, cannot be wrought in naturall Arithmetick.

To work this queſtion therefore, I make one Rod, which in artificiall Numbers ſtands thus 16|5 primes, (for ever ſet down your fractions in artificiall numbers) the Multiplicand, and 320 the Multiplicator, and place them one under another thus;

And becauſe the Multiplicator ends with a cypher, I ſet 3 under 6, 2 under 5, and 0 behind both, and ſay, 0 is 0, which I ſet under 0, and ſo I have done with the cypher.	*Multiplicand*	16|5
	Multiplicator	320
		0

Secondly, 2 times 5 is 10, I ſet 0 under 2, and

16|5
3 20
3300

carry 1 to the next place; again 2 times 6 is 12, and 1 in mind, makes 13, I ſet 3 under 6, and keep 1 in mind: laſtly 2 times 1 is 2, and 1 in mind makes 3, which I ſet under 1, and ſo I have done with that figure.

16|5
3 20
3300
495

Thirdly, 3 times 5 is 15, I place 5 under 3, and keep 1 in mind; again 3 times 6 is 18, and 1 in mind, makes 19, I ſet 9, under 1, or 3, and carry 1 to the next place; laſtly, 3 times 1 is 3, and 1 I carried makes 4, which I ſet before 9, and the Multiplication is ended.

16|5
3 20
3300
495
5280|0

Then I draw a line, and adde the Multiplications together, and the product is 52800, and becauſe I have one fraction in the Multiplicand, I cut off one cypher in the Product with a prime line, according to the 11th. rule, and then it will ſtand thus 5280|0, that is 5280 feet, the queſtion demanded.

2 *Example.*

There are, as by the precedent work you may perceive, 5280 feet in an Engliſh mile; Now

I demand how many inches there are in one mile? Anſwer 63360.

You muſt underſtand that every foot conteines 12 inches, therefore multiply 5280 by 12, and the product will give you the inches in one mile.

Firſt, 2 times 0 is 0, ſet 0 under 2; again, 2 times 8 is 16, put 6 under 1, & keep 1 in minde; again 2 times 2 is 4, and 1 in minde makes 5, ſet 5 under 2, laſtly, 2 times 5 is 10, ſet down 0 under 5, and 1 before it.

Multiplicand. 5280.
Multiplicator. 12
10560

Secondly, once 0 is 0, ſet 0 under 6; againe, once 8 is 8, place 8 under 5; then once 2 is 2, ſet 2 under 0; laſtly, once 5 is 5, which place under 1, then draw a line and adde the Multiplications together, and the product will be 63360, and ſo many inches there are in a mile.

5280
12
10560
5280
63360

3 *Example.*

Seeing a year conteins 365 dayes, (for we will not middle, with the odd houres, minutes and ſeconds, which every fourth year make one day, and is the cauſe of leap year,) I demand how many houres there are in a year? Anſwer 8760.

There are in a natural day 24 houres, therefore multiply 365 by 24, and the product will give you the houres in one year.

365
24
1460

First then, 4 times 5 is 20, ſet 0 under 4, and carry 2 to the next place; againe, 4 times 6 is 24, and 2 I carryed makes 26, put down 6 under 2, and carry 2 to the next place; laſtly, 4 times 3 is 12, and 2 in minde makes 14, ſet 4 under 3, and 1 before it; ſo have I done with the firſt figure 4.

365
24
1460
730

Secondly, 2 times 5 is 10, ſet 0 under 6 and keep 1 in minde; again 2 times 6 is 12, and 1 in minde makes 13, ſet 3 under 4, and carry 1 to the next place; laſtly, 2 times 3 is 6, and 1 in minde makes 7, which having ſet under 1, the multiplication is ended.

365
24
1460
730
8760

Then I draw a line, and add the multiplications together, and the product is 8760, and ſo many houres are there in three hundred ſixty five dayes, or one year. 4 *Example.*

By the former work it appears that there are 8760 houres in 365 dayes; Now I demand how many minutes there are in 365 dayes? Anſwere, 525600.

As there are 24 houres in a naturall day; ſo there are 60 minutes in one houre, therefore multiply 8760, by 60, and the product will give you the minutes in 365 dayes. The

The operation is so manifest by the former Examples, that I forbear to repeat it, but it appears that the product is 525600, and so many are the minutes in 365 dayes.

8760
60
525600

The best proofe of Multiplication is by division; for divide the product by the multiplicand, and if it bring forth the multiplicator in the quotient, it is right, else not.

We wil examine the first question, where the multiplicand is 16|5, the Multiplicator 32c, and the product 5280|0

First, how many times 1 in 5, wherein I can finde it 5 times, but then I cannot finde 5 times 6 in 2, therefore it will be taken but 3 times from 5, and having set 3 in the quotient, by it I multiply the divisor, beginning with the first figure towards the right hand, saying, 3 times 5 is 15, 5 from 8 rests 3, which I set over 8, and keep 1 in minde; then I multiply the next figure, 6 by 3, makes 18, and 1 in minde makes 19, which I cannot take from 2, but from 22 I may, and there rests 3, which I set over 2, and dash 2, and 6, as before I did 8 and 5; and keep 2 in minde; then I multiply 1 by 3, makes 3, and 2 in minde makes 5, which taken out of 5 rests 0, which 0 I set not down Then

Divisor	*Dividend*
16|5	5280|0
33	
5280 |0	(3
x66	

```
  00
 330
5280|0(32
 x655
  x6
```

Then I remove my Diviſor one place forward, and look how often I can finde 1 in 3, which I can finde 3 times, but then I cannot finde 3 times 6, which is 18, in 2, therefore I take it but twice, Then I place 2 in the Quotient, and by it multiply the Diviſor, beginning with 5, the next figure towards the right hand, as before, ſaying 2 times 5 is 10, 0 from 0 reſts 0, which I ſet over 0, and daſh 5 and 0, keeping 1 in mind; then 2 times 6 is 12, and 1 in mind makes 13, take 3 from 3 reſts 0, which I ſet over 3, and daſh 1 and 6, keeping 1 in mind: again 2 times 1 is 2, and 1 in mind, makes 3, 3 from 3 reſts 0, which I put over 3, and daſh 3 and 1.

```
  00
 330
5280|0(320
 x655
  166
   x
```

Then I remove my Diviſor one place forward, but cannot finde it in 000, therefore I place a Cipher in the Quotient, and upon examination finde that it is the ſame with the Multiplicator, therefore I conclude the Multiplication is right.

DIVI-

DIVISION.

THe uſe of *Diviſion* is to divide any number into as many portions as you pleaſe; and it conſiſteth of three parts, the Diviſor, the Dividend, and the Quotient.

1 *Example.*

A well minded man in his will gave 1650 pounds to this purpoſe for ever, namely that it ſhould from time to time be lent for three years *gratis* to 33 poor men newly come out of Apprenticeſhip, to ſet up their trades withall, and appointed Feoffees to ſee it diſpoſed of according to his ſaid will; I demand how much muſt be lent to every man? anſwer 50*lb*.

You may perceive that in this example both the Diviſor and Dividend are whole numbers onely, therefore according to the 15th rule, look how often you can finde the whole numbers of the Diviſor, in the whole numbers of the Dividend, ſo many whole numbers you ſhall have in the Quotient, and the remainer (if there be any) are fractions, but in this preſent example there is no remainer,

if

if there had, then we muſt have added cyphers, as is there directed, to have brought forth the fractions in the quotient.

Note, that in this, or the like Example, the money given muſt be the dividend, the number of men to whom it muſt be lent the diviſor, and the quotient will be the anſwer.

33 1650 (5
165
0

Firſt therefore, 33 cannot be found in 16, but in 165 it may, and thereby I perceive, I ſhall have but 2 figures in my quotient; then I look how often I can finde 3 the firſt figure of the diviſor, in 16, the 2 firſt figures of the dividend, which will be 5 times, and 1 remaining, which with the next figure 5 in the dividend, makes 15, wherein 3, the next figure of the diviſor may be found as often, therefore I place 5 in the quotient, and by it multiply 33 the diviſor, makes 165, which I place under the prickt numbers, and ſubſtract, and there reſts 0, which I place under 5.

33 1650 (50
165
00

Secondly, I take down the Cypher remaining, and place it on the right hand of the other Cypher, and becauſe I cannot finde the diviſor in 00, I ſet a Cypher in the quotient according to the 14th rule, and the work is ended: whereby it ap-

appears that the quotient is 50, and ſo many pounds, muſt every man have lent him according to the Teſtators will.

2 *Example.*

A Charitable man gave to the Church-wardens & Overſeers of the pariſh of D. 20 pounds to be equally beſtowed on 17 of the pooreſt men in the ſaid pariſh; I demand how much every of them muſt have? Anſwer 1 pound, 3 ſhillings, 6 pence, 1 farthing.

As in the former example, ſo in this, the money given is the dividend, the number of men the diviſor, and the quotient the anſvver.

Two ways to divide you have already ſeen, beſides the uſuall common vvay and Napiers bones, another way I will here ſet dovvn, and leave it to every one to uſe vvhich likes him beſt.

The third vvay is by a Table, made by Multiplication after this manner, firſt dravv a line, and on the left ſide thereof ſet dovvn the diviſor, and on the right ſide over againſt it the figure 1: Then multiply the diviſor by 2, and on the left ſide the line under the diviſor place the product, and over againſt it on the right ſide 2; in like manner multiply the diviſor by all the 9 digits, and place the products under one another, and the digitts on the right hand the

line

line over againſt them, as in the annexed table appeareth, wherein the Digits ſerve to ſhew you how often you can finde the Diviſor, in the Dividend, and to be ſet down in the Quotient.

And becauſe in this example, there will be but one whole number in the Quotient, and the reſt fractions and that the Dividend is whole numbers onely, as well as the Diviſor, therefore I adde Ciphers to bring out the Fraction according to the 15 rule.

17	1	20|00000(1|1
34	2	17
51	3	30
68	4	17
85	5	13
102	6	
119	7	
136	8	
153	9	

First work, how often can you finde 17 in 20, look in the Table for 20, or find it betwixt 2 numbers, 34 is too great, 17 is too little, which take (for note that you muſt ever take the leſſer number) and the place thereof, or the Digit over againſt it, is 1, which ſhews that you can finde the Diviſor but once in the Dividend, therefore ſet 1 in the Quotient, and the numbers in the firſt place, which are 17, the Diviſor, ſet under 20, then draw a prime line, and ſubſtract, reſts 3.

Then

Then becauſe you can have no more whole numbers in the Quotient, draw a prime line after 1, and take down the prime Cipher, to the remainer 3 makes 30; look in the table for 30, or finde it between two numbers, the ſecond place is too great, the firſt is too little, which take, place 1 in the Quotient, after the prime line, and 17 under 30, draw a line and ſubſtract, reſts 13.

Take down the ſecond cypher to 13 makes 130, look in the table for 130 the 8th. place is too great, the 7th. too little, which take, place 7 in the Quotient, and 119, the fignres in the 7th. place, under 130, draw a line and ſubſtract reſts 11.

17	1
34	2
51	3
68	4
85	5
102	6
119	7
136	8
153	9

```
      .....   .....
20|00000(1|17647
  .
  17
  ---
   30
   17
   ---
   130
   119
   ---
    110
    102
    ---
     80
     68
     ---
      120
      119
      ---
        1
```

Take

Take down the third cypher to 11, makes 110, the 7th place is too great, the 6th too little, which take, ſet 6 in the quotient, and 102, under 110, draw a line and ſubſtract reſts 8.

Take down the fourth cypher to 8, makes 80, look in the table for 80, the 5th place is too great, the 4th too little, which take, ſet 4 in the quotient, and 68, the numbers in the 4th place, under 80, dravv a line and ſubſtract reſts 12.

Take dovvn the laſt cypher to the remainer 11, makes 120, which look for in the table, the 8th place is too great, the 7th too little, which take, place 7 in the quotient, and 119, (the numbers in the ſeventh place) under 120, dravv a line and ſubſtract reſts 1, and the work ended.

Now to finde the value of this fraction, if you multiply it according to the 6th rule, it will amount to 3 ſhillings, 6 pence, 1 farthing; Or if you proceed according to the 7th rule, then 1 prime is 2 ſhillings, and 5 ſeconds ſubſtracted from 7 ſeconds, is 1 ſhilling, makes 3 ſhillings, & 2 ſeconds remaining, and 6 thirds make 26 farthings, and becauſe it exceeds 24, take 1 frō it, reſts 25 farthings, vvhich is 6 pence, 1 farthing, ſo the vvhole fraction is 3 ſhillings, 6 pence, 1 farthing, and the whole quotient 1 pound, 3 ſhillings, 6 pence, 1 farthing, and ſo much muſt every man have.

3 *Ex-*

3 *Example.*

One Land measurer hath a chaine 4 perches long, consisting of 100 lincks, every linck being of an equall length, and every 25 lincks a just perch, at 16 foot, and $\frac{1}{2}$ to the perch; I demand how long every linck must be? Answer 7 inches, and $\frac{92}{100}$ which wants but little of 8 inches.

Remember alvvayes if you have a fraction either in the divisor or dividend, or both, to set them dovvn in artificiall numbers.

To work this question or the like, make 25, the lincks in one perch the divisor, and 16 foot and $\frac{1}{2}$ the length of the perch the dividend, and add cyphers to bring forth the fraction, and the quotient will give you the length of every linck.

```
      ~~1~~10
25    ~~16~~|5(0̇  (0|6̇6̇
       ~~2~~ ~~5~~ ~~5~~      12
        ~~2~~          ----
                      132
                      66
                      ----
                      7|9̇2̇
                      ----
```

The former directions, and the rules, make the operation so manifest, that it will be needless here to repeat it, therefore I only set down the example ready wrought and leave the operation to practise.

And

And to finde how many inches are conteined in $\dot{6}\dot{6}$ seconds, multiply $\dot{6}\dot{6}$ by 12 the inches in one foot, and the product will be $7|\dot{9}\dot{2}$, which shews that every linck must be 7 inches, and 92 parts of an inch divided into 100 parts.

4 *Example.*

Another Land measurer hath a chaine likewise, 4 perches long, consisting but of 80 lincks, every linck being of an equall length, and every 20 lincks a just perch, at 16 foot and $\frac{1}{2}$ to a perch; I demand the length of every linck? Answer 9 inches, and $\frac{9}{10}$, or 90 parts of an inch divided into 100 parts.

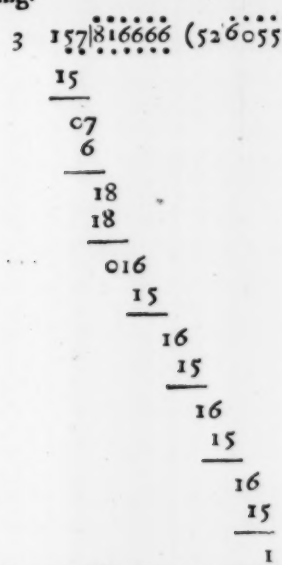
```
20  16|5̇0̇0̇(0|8̇2̇5̇          8̇2̇5̇
    1̇6̇0                      12
    ----                     ----
      50                     1650
      40                     825
     ----                    ----
     100                    9|9̇0̇0̇
     100
     000
```

The manner of operation is as the former, and likewise to finde the content of the fraction, in inches and parts, therefore needless to be rehearsed.

5 *Example.*

Three Merchants adventuring together gained 157 pounds, 16 shillings 4 pence; whereof every

every man was to have an equall ſhare or part; I demand how much every Merchant muſt have? Anſwer 52 pounds, 12 ſhillings, 1 peny, 1 farthing.



In this example, the money gained is the dividend, the number of Merchants 3, the diviſor, and the quotient the anſwer.

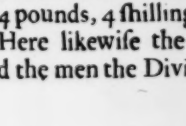
The content of the fraction is found by the former directions, and rules.

6 *Ex-*

6 *Example.*

There is 235375 pounds, 15 ſhillings, 6 pence, to be divided among 325 men; I demand how much each man muſt have? Anſwer 724 pounds, 4 ſhillings, 8 pence.

Here likewiſe the money is the Dividend, and the men the Diviſor.



7 *Example.*

There is a Fountain wherein is placed the ſtatue of a Mermaid, from which iſſues three ſtreams, one from her mouth, and two from her breſts: Theſe ſtreams are ſo ordered, that they all fall into one Ciſtern, and if the ſtream from her left breaſt be opened, and the reſt ſhut, it will fill the Ciſtern in 48 hours, if that be ſtopt, and the right breaſt ſet open, that will fill the Ciſtern alone in 36 hours, but if both

thoſe be ſhut, and the ſtream from her mouth ſet open, that will fill the Ciſtern in 12 hours.

The queſtion is, in how many hours all the ſtreams ſet open at once, will fill the Ciſtern? Anſwer in 7 hours 23 minutes, and 19 ſeconds.

To work this or the like queſtion, ſet down the ſeveral times that every of the three ſtreams will fill the Ciſtern in Fractions thus $\frac{1}{21}$, $\frac{1}{16}$, $\frac{1}{12}$, then divide 1, adding Cyphers by 48, likewiſe by 36, and alſo by 12, then adde the Quotients, and the remainers together, and the totall ſhall be the Diviſor, by which divide 1, adding 1 Cypher, to turn it into the ſame Denomination that the firſt figure in the Diviſor is off, according to the 17th. rule, and more Cyphers after the prime line, to bring forth the fractions, and the Quotient of this Diviſion is the anſwer to the queſtion.

$\frac{1}{21}$ *of* 1 *pound is*	02083	
	16	*Remainer.*
$\frac{1}{16}$ *of* 1 *pound is*	02777	
	28	*Remainer.*
$\frac{1}{12}$ *of* 1 *pound is*	08333	
	4	*Remainer.*
Totall	13241	*and Diviſor,*

To finde the content of the fraction is ſhewed in the 6th rule, to which I refer you.

Diviſor	*Dividend*	*Quotient.*
13241	10000000000	(75522

8 Example.

A ſtudent deſirous to have a book writ out ſpeedily, went to one Scrivenor who promiſed to write it out in 12 dayes, but the time being too long, he went to another who promiſed to write it out in 10 dayes; The queſtion is, in how many dayes both of them, joyning their labours together, will write it out? Anſwer in 5 dayes, 5 hours, 26 minutes, and 52 ſeconds.

The manner of operation is as the former example.

$\frac{1}{12}$ *of* 1 *lb is* 08333	*Diviſor*	*Dividend*	*Quotient*
$\frac{1}{10}$ *of* 1 *lb is* 10000	18333	10000000000	(54545

Totall 18333 *and Diviſor.*

To finde the content of the fraction is ſhewed in the 6th rule.

9 Example

Admit a Hare having 40 rods (every rod 16 foot and $\frac{1}{2}$) ſtart of a Greyhound, runs every minute 12 rods, and the Dog every minute 15 rods;

rods: I demand in what time the Dog wil take the Hare, and how many rods he muſt run before he takes her? Anſwer, he will take her in 13 minutes, and 20 ſeconds of time, and hee muſt run 260 rods before he takes her.

Subſtract the Rods the Hare runs in one minute, out of the rods the Dog runs, and the remainer ſhall be the diviſor, the ſtart or law the Hare had, the dividend and the quotient the anſwer.

The Dog runs 15 *Rods.*
The Hare runs 12 *Rods.*

Remainer 3 and Diviſor.

Diviſor	*Dividend*	*Quotient.*
3	40|0000	(13|3333

Now for the proof, and ſo we will conclude Diviſion.

As the beſt proof of Multiplication is Diviſion: ſo the beſt proof of Diviſion is by Multiplication. For multiply the quotient by the diviſor, and adde the remainer, if there be any, and if it produce the dividend, it is right, elſe not.

Aſwell for tryall, as direction, we will examine the third example, wherein is no remainer, and the fift where there is a remainer.

3 *Example.*

66 *Quotient*
25 *Diviſor*

330
132

16|50 *Dividend*

5 *Example.*

52|605555 *Quotient*
3 *Diviſor*

157|816665
1 *Remainer*

157|816666 *Dividend*

Thus upon examination it appears, that theſe two ſummes are right wrought. In like manner you may try the reſt and all other.

THE

THE RVLE OF THREE DIRECT.

THe former Arts or Rules of Numeration, Addition, Substraction, Multiplication, and Division, are but as it were introductions to this Golden Rule, of all others the most usefull

This rule hath divers appellations; It is called the Rule of Three, because three Numbers are given to finde a fourth: It is called the Rule of Three Direct, both in regard it works forward, multiplying the second number into the third, and dividing by the first, and also of the Backward Rule of Three, which worketh backward as this doth forward. It is also call'd the Rule of Proportion, because the 4th. number holds such proportion to the third, as the second doth to the first; and because it wil find a fourth, a fifth, a sixth number, &c. in continuall proportion; Lastly, it is called the *Golden Rule*, for it's excellent operation, And

it is known by { *at* / *if* / *as* } and { *how*, / *what*, / *so* }

For the working of this Rule, remember always to set the first number given, in the first place, the second in the second place, and the third in the third place: and to find the places, observe the annexed figure.

1 *place*	2 *place*
3 *place*	4 *place*

There are three wayes in Arithmetick, to work this Rule.

The first and most usuall way is by Multiplication and Division, for first they multiply the second number into the third, and divide the product by the first, For,

As 16 to 32;	16	32
So is 4 to 8.	4	8

Here multiplying 32 by 4, and dividing the product by 16, the quotient or fourth number will be 8.

A second way in Arithmetick, is by Division and Multiplication; for where the second number is greater than the first, they divide the second by the first, and multiply the quotient by the third, and the product will be the fourth number.

As in the former example, dividing 32 by 16, the quotient wil be 2, which multiplyed by 4, the product will be 8, the fourth number.

	00
	32(2
	x 4
Product	8

The

The third way is by diviſion and diviſion, for where the ſecond number is leſſe than the firſt, they divide the firſt by the ſecond, and the third by that quotient. And thus:

As 16 to 4; ſo is 32 to 8.

For divide 16 by 4, the quotient will be 4, by which divide 32, and the quotient will be 8, the fourth number as before.

Theſe things premiſed, we will proceed to certain Propoſitions.

```
 0
16(4
 4
 0
32(4
 4
```

1 *Having the Diameter and Circumference of one Circle, and the Diameter of another, to finde the Circumference of the ſecond Circle.*

AS the Diameter of one Circle,
to the Circumference thereof:
So is the Diameter of another Circle:
to the Circumference thereof.

So the Diameter of one Circle being 7 inches, and the Circumference 21 inches, and 994 parts of an inch divided into 1000 parts, and the Diameter of another Circle 15 inches; the Circumference of the second Circle will be found to be 47 inches, and 130 parts of an inch divided into 1000 parts. For,

As 7 to 21|994;
So are 15 to 47|130

7 Z 21|994
15 47|130

21|994
15
109970
21994
329|910

4 2
329|910(47|130
27 27

2 *Having the Circumference and Diameter of one Circle, and the Circumference of another, to finde the Diameter of the second Circle.*

AS the Circumference of one Circle,
to the Diameter thereof:
So the Circumference of another Circle,
to the Diameter thereof.

So the Circumference of one Circle, being 21 inches, and 994 parts, as before, and the Diameter 7 inches; and the Circumference of ano-

another Circle 47 inches, and 130 parts, the length of the Diameter of the second Circle, will be found to be 15 inches. For,

As 21|994 to 7;
So are 47|130 to 15.

47|130 × 7 = 329|910

21|994) 329|910 (15
21994
109970
109970
000000

21|994 × 7
47|130 × 15

3 *Having the Diameter of a Circle, to finde the Circumference.*

AS 1000, to the Diameter;
So are 3142, to the Circumference.

So the Diameter being 15 inches (as in the former Proposition) the Circumference will be found to be 47|130. For,

As to 1000 15;
So are 3142 to 47|130

1000 × 15
3142 × 47|130

3142
15
15710
3142
47|130

Ha-

4 *Having the Circumferenee of a Circle, to finde the Diameter thereof.*

AS 3142 to the Circumference;
S o are 1000 to the Diameter.

So the Circumfereuce of a Circle being $47|\dot{1}\dot{3}\dot{0}$. The Diameter vvill be found to be 15 inches. For,

As 3142 to $47|\dot{1}\dot{3}\dot{0}$	3142	Z	$47|\dot{1}\dot{3}\dot{0}$
So are 1000 to 15.	1000		15

1571(0
47130|000(15
31422
314

These tvvo last Propositions vve have here inserted out of Mr. *Gunter*, principally to shevv their agreement vvith this Arithmetick; vvhich and the tvvo former, vve have both vvrought, and likevvise set dovvn in the figures; These that follow, we will onely set down in the figures, and give the proportions, and leave the operation to practice.

5 *Having a small number of yards of cloth and the price thereof given, to finde what a greater number of yards will cost after the same rate.*

AS the lesser number of yards of cloth:
is to the price thereof;

So

So the greater number of yards,
to the price thereof.

So if 7 yards of Kersey cost 2 pounds, 6 shillings 8 pence, 475 yards will be found to cost 158 pounds, 6 shillings, 8 pence. For

As 7 to	2|33333	7	2|33333
So are 475 to	158|33310	475	15833310

6 Having a small number of Els of Holland cloth, and the price given, to finde what a greater number of Els will cost after the same rate.

AS the fewer Els of Holland cloth
to the price thereof;
So the greater number,
to the price thereof,

So if 69 Els of Holland cloth cost 17 pounds, 7 shillings, 9 pence; 256 Els after the same rate, will cost 64 pounds, 10 shillings 2 pence, 2 farthings. For

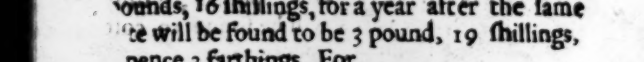
As 69 to	17|3875	69	17|3875
So are 256 to	64|5101	256	64|5101

7 Having the use of 100 *li. for a years time, to find the use of a lesser or greater sum.*

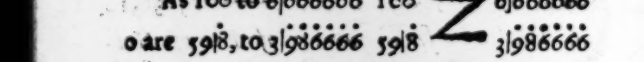
AS 100 pound to the use thereof,
So is any other summe to the use thereof.

So

So if the uſe of 100 pound for one year, be 6 pound 13 ſhillings 4 pence; the uſe of 59 pounds, 16 ſhillings, for a year after the ſame rate will be found to be 3 pound, 19 ſhillings, 3 pence 3 farthings. For,



Or if the uſe of 100 pounds be 8 pounds, the uſe of 59 pounds, 16 ſhillings, will be found to be 4 pounds, 15 ſhillings, 8 pence 1 farthing. For,



8 *Having the number of ſome hundreds of any Merchandize, and the price, to finde the price of a greater number.*

AS the leſſeer number of hundreds,
to the price thereof;
So the greater number,
to the price thereof.

So

So if 7 hundred weight of Currants coſt 15 pounds, 3 ſhillings, 9 pence, 23 hundred weight and $\frac{1}{2}$, will be found to coſt 50 pounds, 19 ſhillings 8 pence 3 farthings. For,

As 7 to 15|1875;	7	Z	15|1875
So are 23|5 to 50|98660	23|5		50|98660

9 *Having the number of ſome hundreds of Merchandize, and the price to finde the price of a leſſer quantity.*

AS the greater number to the price thereof; So the leſſer number to the price thereof.

So if 25 hundred weight of Currants coſt 54 pounds, 17 ſhillings, 6 pence: 5 hundred weight wil coſt 10 pounds 19 ſhillings, 6 pence. For

As 25 to 54|875	25	Z	54|875
So are 5 to 10|975	5		10|975

10. *Having the height of a Pole, and the length of the ſhadow it caſts, and the length of the ſhadow of any Fort, Tower, or Houſe, to finde the height of ſuch Fort, Tower or Houſe.*

AT the length of the ſhadow the Pole caſts,
So the height of the Pole;
So the length of the ſhadow the Tower caſts,
to the height of the Tower.

So if a Pole 12 foot high ſet up right, caſt a ſhadow 18 foot long, and at the ſame inſtant, a Tower caſts a ſhadow 168 foot long, the height of the Tower will be found to be 112 feet. For,

As 18 to 12;
So are 168 to 12.

11. *Having the length and breadth of a piece of land, and the length and breadth of one houſe, to finde how many houſes may be built upon it.*

MUltiply the length of the houſe by the breadth; Then

As

As that Product,
to the breadth of rhe land;
So the length of the land
to the houſes will ſtand upon it.

So if a piece of land be 100 Rods or Perches long, and 70 Rods broad, it will be found that 350 houſes 5 Rods long, and 4 Rods broad may be built upon it: For,

As 20 to 70;	20	Z	70
So are 100 to 350	100		350

Theſe 11 examples, we have wrought by Multiplication and Diviſion, according to the firſt and moſt uſuall way, before mentioned, and leave them to Practitioners to be wrought, either of the other two ways.

THE

THE BACKWARD RULE OF THREE

THe Rule of three Direct, worketh forward (as before is declared) multiplying the ſecond number into the third and dividing by the firſt. But this Rule contrarily worketh backward, multiplying the firſt number into the ſecond, and dividing by the third: for which cauſe it is called the *Backward Rule of Three.*

1 *Having the value of the wine that will ſuffice any number of men, and the price of the tunne of wine at the ſame time, to finde how many men the like quantity of wine will ſuffice, when the tunne of wine is at another rate.*

As the ſecond price of the Tunne of wine,
Is to the firſt price:
So is the firſt number of men,
To the ſecond.

So if 15 ſhillings in wine will ſuffice 46 men, when the tun of wine is at 12 pounds, it wil ſuffice 69 men when the tun is at 8 pounds. For,

As 8 to 12 ; 46 to 69.

2 *Having the length of the day, and the number of days, a man will make a journey in, to finde in how many dayes, he will make the ſame journey, when the dayes are of another length.*

AS the ſecond length of the day, to the firſt, So the firſt number of days, to the ſecond.

So if a man makes a journey in 24 dayes, when the day is 12 hours long, he will make the ſame journey in 18 dayes, when the day is 16 hours long. For,

As 16 to 12 ; 24 to 18.

3 *Having the weight of a penny loaf, when the buſhell of wheat is at one price, to finde the weight of the penny loaf, when the buſhell of wheat is at another price.*

AS the ſecond price of the buſhell of wheat, is to the weight of the penny loaf given :

So the first price of the bushell of wheat, to the weight of the penny loaf required.

So if the penny loaf weigh 4 pounds, when the bushell of wheat is at 3 shillings, it will be found to weigh 6 pounds, when the bushell of wheat is at 2 shillings. For,

As 1 to 4, 3 Z 4
So are 2 to 6. 2 Z 6

Or if the weight of the penny loaf be 2 pounds ½, when the bushell of wheat is at 3 shillings, it will weigh 3 pounds ¾, when the bushell of wheat is at 2 shillings. For,

As 1 to 2½ 3 Z 2½
So are 2 to 3¾. 2 Z 3¾

Or if the weight of the penny loaf be 9 oun. and ¼, or 15 penny weight, when the bushell of wheat is at 10 shillings; the penny loaf will weigh 24 ounces, 7 penny weight, and ½ penny weight, when the bushell of wheat is at 4 shillings. For,

As 2 to 9½ 5 Z 9½
So is 5 to 24 ½. 2 Z 24½

Note that in gold, silver, bread, and such like things, not garbleable, 20 penny weight make an ounce, and 12 ounces a pound: And

to

to finde how many ounces, the fractions contein, multiply them by 12, and the product will caſt over the prime line the ounces.

And if any remainer be after ſuch multiplication, multiply that by 20, and that product will caſt over the prime line, the penny weights therein.

If there be another remainer, and you deſire to know the contents thereof alſo, then multiply that by 24, the grains in one penny weight, and you will have your deſire.

4 *Having the ſumme of money that one friend lent another, and the time it was lent, and likewiſe the time that the like courteſie is deſired again, to finde how much money he ought to ſend him.*

AS the time deſired, is to the money firſt lent; So is the firſt time, to the money required.

So if one have lent his friend 340 pounds for 7 moneths, he ought to lend him 216 pounds, 7 ſhillings 3 pence, 1 farthing, for 11 moneths to equall his courteſie. For,

As 11 to 340;	11	Z	340
So is 7 to 216|7636.	7		216|3636

5 *Having the number of men, and the time wherein they will build a fort, and a leſſe number of men given, to finde in what time the leſſe number will build the like fort.*

AS the fewer number of men, to the firſt time,
So the greater number of men to the 2d. time.

So if 30 men will build a fort in 25 weeks, 20 men will build the like fort in 37 weeks and a half. For,

As 20 to 25 ; 30 — 25
So are 30 to 37½ 20 — 37½

6 *Having the breadth and yards of cloth that will hang a room, and the breadth of another piece of cloth, to finde how many yards of the ſecond breadth, will hang the ſame room.*

AS the leſſer breadth of cloth, to the greater breadth :
So the firſt number of yards, to the number required.

So if 60 yards of cloth, of ⅓ of a yard broad will hang a room, it will be found that 90 yards of cloth of ⅔ a yard broad, will hang the ſame room. For,

As 5 to 7½ 60 — 7½
So are 60 to 90 5 — 90 *Ha-*

7 *Having the breadth and length of a piece of cloth, and the breadth of a piece of ſtuffe given, to finde how many yards of the ſtuffe, will line the cloth.*

AS the breadth of the ſtuffe, to the breadth of the cloth;
So the yards of cloth, to the yards of ſtuffe that will line it.

So it will be found that 10 yards, and about $\frac{1}{10}$ of a yard of Say, of $\frac{3}{4}$ of a yard broad will line 4 yards $\frac{2}{3}$ of a yard of cloth of 1 yard and $\frac{1}{2}$ and $\frac{1}{4}$ of broad. For,

As 75 to 1|625 4|66667 — 1|625
So 4|66667 to 10|11118 — 75 — 10|11118

8 *Having the length and breadth of a foot ſuperficiall, and a greater breadth given in inches, to find how many inches in length will make a foot anſwerable to the greater breadth.*

AS the breadth in inches, to 12 inches;
So is 12 inches, to the length required.

So if a board or piece of glaſſe be 16 inches broad, it will be found that 9 inches in length, will make a foot ſuperficiall. For,

As 16 to 12 — 12
So are 12 to 69 — 16 — 9

9 *Having the length and breadth of a foot ſuperficiall, and a leſs breadth given in inches, to finde how many inches in length, will make a foot anſwerable to the breadth given.*

AS the breadth given in inches, unto 12;
So are 12 inches, to the length required.

So if a board or piece of glaſſe be 7 inches, and ½ broad, it will require 19 inches, and 86 parts in length to make a foot ſuperficiall For,

As 7|5 to 12; 12 Z 12
So are 12 to 19|8620 7|5 Z 19|8620

10 *Having the Baſe and height of a ſquared piece of timber that will make a foot ſolid, and another Baſe given in inches, to find how many inches in height, will make a foot ſolid anſwerable to the ſecond Baſe.*

AS the ſecond Baſe to 12 inches,
So is the firſt Baſe, to the height or thickneſſe required.

So if a Baſe of 144 inches in length, require 12 inches in height to make a foot ſolid; a Baſe of 216 inches, will require 8 inches in height. For,

As 216 to 12; 144 Z 12
So are 144 to 8. 216 Z 8 THE

THE DOVBLE RULE OF THREE.

THis Rule ſerveth to work any queſtion compoſed of 5 numbers, without double working the Rule of Three.

And for directions to work it, remember always to place the numbers ſo, that the firſt term and the fourth agree in one denomination, alſo the ſecond term & the fift, & likewiſe the third & the ſixt. ſo thatif the denomination of the firſt term be of Students, (as in the firſtexample)the 4th. term muſt be of Students likewiſe, if the denomination of the ſecond term be of time, as in the ſame example, the fift muſt be of time likewiſe. And if the denomination of the third term be of expences,as it is, the quotient and ſixt term, which is the anſwer, will be alſo of the ſame denomination, as in the firſt example appeareth.

This Rule is wrought both according to the Rule of Three Direct, and alſo according to the Backward Rule of Three.

In the operation according to the Rule of Three direct,we multiply the firſt term into the ſe-

ſecond, and the product is the firſt number, likewiſe the product of the fourth and fift terms multiplyed one into another is the third number, and the third term is the ſecond number: But contrarily in the Backward Rule of Three, for there the product of the fourth and fift terms multiplyed in themſelves is the firſt number, the third term the ſecond number, and the product of the firſt and ſecond terms, the third number.

We will give ſome examples both ways, and firſt according to the Rule of Three Direct.

1 *Having the time, and money that any number of Students will ſpend in ſuch time, to finde how much money any other number of Students will ſpend in any other time.*

AS the product of the firſt and ſecond term,
to the third term,
So the product of the fourth and fift term,
to the ſixt term.

So if 4 ſtudents in 3 moneths ſpend 19 pounds, 8 ſtudents in 9 moneths, will ſpend 114 pounds after that rate.

As

As 12 to 19; 12 Z 19
So are 72 to 114. 72 Z 114

1 *term*	2 *term.*	3 *term*	4 *term.*	5 *term.*
Students.	*time.*	*expences.*	*Students.*	*time.*
4	3	19	8	9

2 *Having the profit made, or gained by* 100 *pounds in* 12 *moneths, to finde what any other ſumme of money will gain in any leſs time.*

AS the product of the firſt and ſecond term, is to the third term;
So the product of the fourth and fift term, to the ſixt term.

So if 100 pounds in 12 moneths, gain 15 pounds, 60 pounds in 8 moneths will gain 6 pounds after the ſame rate. For,

As 1200 to 15; 1200 Z 15
So are 480 to 6. 480 Z 6

100 12 15 60 8

3 *Ha-*

3 *Having the profit or gain made by any ſmall ſumme of money in a little time, to find what profit may be made by a hundred pounds in a year.*

As the product of the firſt and ſecond term, is to the third term:
So the product of the fift and fourth term, to the ſixt term.

So if 60 pounds in 8 moneths, gain 6 pounds, 100 pound in 12 moneths, will gain 15 pounds For,

As 480 to 6; 480 6
So are 1200 to 15. 1200 Z 15
60 8 6 100 Z 12

So alſo if 12 ſhillings 6 pence in 2 moneths, gain 2 pence 2 farthings; 100 pounds in 12 moneths will gain 10 pounds, For,

As 1|250 to 0104168 1|250 Z 0104168
So 1200 to 9|999344 1200 Z 9|999344
625 2 0104168 100 12

4 *Having the price that a yard, or pound weight of any Merchandize coſt, to finde at what price to ſell the ſame upon time to gain any rate in the hundred pounds* per annum.

AS the product of the firſt and ſecond term, to the third term :
So the product of the fourth and fift term, to the ſixt term.

So if one yard of Sattin coſt 12 ſhillings, 6 pence, he muſt ſell the ſame again at 12 ſhillings, 8 pence, 2 farthings, to be paid at 2 moneths, to gain after the rate of 10 pounds in the 100 pounds in 12 moneths. For,

If 100 pounds in 12 moneths, gain 10 pounds: 12 ſhillings 6 pence in 2 moneths, will gain 2 pence 2 farthings. For,

As 1200 to 10 : 1:00 Z 10
So are 1|250 to 010416 1|250 Z 010416

This gain 010416, in coyn 2 pence. 2 farthings, added to the price the yard of Sattin coſt, makes 12 ſhillings, 8 pence, 2 farthings, and ſuch is the price he muſt ſell it at, to gain after the rate of 10 pounds in the 100 pounds in 12 moneths; as before.

So

So alſo if 1 pound of Mace coſt 5 ſhillings, 10 pence, and the Merchant ſell the ſame again for 6 ſhillings to be paid at 3 moneths, he will give after the rate of 11 pounds, 8 ſhillings, 7 pence in the 100 pound in 12 moneths. For,

If 5 ſhillings 10 pence in 3 moneths gain 2 pence; 100 pounds in 12 moneths will gain 11 pounds, 8 ſhillings 7 pence. For,

As 875004 to 008334 875004 Z 008334
So are 1200 to 11|429 1200 Z 11|229

5 *Having the quantity of Oats, and time they will ſerve any number of horſes, to find what time any other quantity of Oats will ſerve any other number of horſes.*

AS the product of the firſt and ſecond term, to the third term:
So the product of the fourth and fift term, to the ſixt term.

So if 8 horſes in 12 dayes ſpend 9 buſhels of oats, 16 horſes will ſpend 36 buſhels in 24 days. For,

As 96 to 9, 96 Z 9
So are 256 to 24: 256 Z 24

6 *Ha-*

6 *Having the price that any quantity of Merchandize coſt, to finde how the ſame muſt be ſold, to be paid at two payments, to gain any rate in the* 100.

AS the product of the firſt and ſecond term, to the third term;
So the product of the fourth and fift term, to the ſixt term.

So if 100 pounds weight of Cynamon, coſt 40 pounds, the ſame muſt be ſold for 40 pounds 15 ſhillings, to be paid at two payments, *viz.* $\frac{1}{4}$ at 1 moneth, and $\frac{3}{4}$ reſidue at 3 moneths, to gain after 9 pounds in the 100 pounds in 12 moneths.

Multiply the ſeverall payments by their ſeverall times as $\dot{2}\dot{5}$ by 1, makes $\dot{2}\dot{5}$ and $\dot{7}\dot{5}$ by 3, makes $2|\dot{2}\dot{5}$, then adde the products together, and they make $2|\dot{5}\dot{0}$, the artificiall numbers, expreſſing two moneths and a half. Now,

If 100 pounds in 12 moneths gain 9 pounds, 40 pounds in 2 moneths and a half will gain 15 ſhillings. For,

As 1200 to 9; 1200 Z 9
So are 100|00 to $\dot{7}\dot{5}\dot{0}$: 100|00 Z $\dot{7}\dot{5}\dot{0}$

100. 12 9 40 $2|\dot{5}\dot{0}$

Then

Then adde 750 to 40, makes 40|750, which is in Coyn 40 pounds, 15 ſhillings, and ſuch is the price he muſt ſel 100 pounds of Cynamon at, to be paid at the times aforeſaid, to gain after the rate of 9 pounds *per Cent.*

Or you may work it otherwiſe at two operations, thus;

If 100 pounds in 12 moneths gain 9 pounds, what will 10 pounds, ($\frac{1}{4}$ of the price the Cynamon coſt) gain in one moneth? And

If 100 pounds in 12 moneths gain 9 pounds, what will 30 pounds gain in 3 moneths? Then adde both the quotients together, and the totall will be 750, as before, and ſo both ways, the queſtion is found.

THE

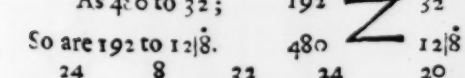
THE DOVBLE RULE OF THREE wrought Backward.

THe manner of the operation hereof we have formerly ſhewed, therefore we will onely ſet down one example, and ſo conclude this Rule.

1 *Having the buſhels of oats, and time they will ſerve any number of horſes, to finde how long the like quantity of oats will ſerve any other number of horſes.*

AS the product of the fourth and fift te ms, to the third term,
So the product of the firſt and ſecond term, to the ſixt term.

So if 24 buſhels of oats ſerve 8 horſes 32 dayes, 24 buſhels of oats will ſerve 20 horſes 12 dayes, and 19 hours: For,



The

THE RVLE OF THREE DIRECT after a duplicated Proportion.

THis Rule concernes queſtions of Proportion betwixt lines and ſuperficies. The uſe of it is to finde the ſuperficiall content, and Diameter of any Circle.

1 *Having the Diameter and ſuperficiall content of one Circle, and the Diameter of another, to finde the ſuperficiall content of the ſecond Circle.*

As the ſquare of the diameter of the firſt circle, to the ſuperficiall content thereof;
So the ſquare of the diameter of the 2d. circle, to the ſuperficiall content thereof.

So the diameter of our circle being 14 foot, and the ſuperficiall content of the ſame circle 154 feet; The diameter of another circle being 28 feet, the ſuperficiall content thereof will be be found to be 616 feet. For,

As 196 to 154; 196 — 154
So are 784 to 616 784 — 616

2 *Ha-*

2 *Having the ſuperficiall content, and Diameter of one Circle, and the ſuperficiall content of another, to finde the Diameter of the ſecond Circle.*

AS the content of the firſt Circle doubled,
is to the diameter thereof.
So the content of the ſecond Circle,
to the diameter thereof.

So the ſuperficiall content of the firſt Circle, being 154 feet, and the diameter thereof 14: And the ſuperficiall content of another Circle 616 feet, the diameter thereof will be found to be 28 feet. For,

As 308 to 14;	308	14
So are 616 to 28.	616	28

THE BACKWARD Rule of Three after a duplicated Proportion.

THe uſe of this Rule is to diminiſh or augment a ſuperficies in any Proportion given.

1 *Having the content of a piece of land according to one Perch, to finde the content of the ſame piece of land according to a greater Perch.*

AS the ſquare of the greater perch,
is to the ſquare of the leſſer;
So the content in acres, according to the leſſer perch,
to the content in acres according to the greater.

So if a piece of Land contein 34 acres, 1 rod, and 10 perches, at 16 foot and a half to the perch, it will be found to contein 28 acres, 3 rods, and 13 perches, at 18 foot to the perch. For,

As 324 to 272|25 :: 34|3125 Z 272|25
So 34|3125 to 28|8320 :: 324 Z 28|8320

2 *Ha-*

2 *Having the content of a piece of land according to one Perch, to finde the content of the ſame piece of land, according to a leſſer Perch.*

AS the ſquare of the leſſer perch,
to the ſquare of the greater;
So the content in acres, according to the greater perch,
to the content in acres, according to the leſſer.

So if a piece of Land contein 7 acres after 16 foot and a half to the perch; it will contein 8 acres, one rod, and 35 perches after 15 foot to the perch. For,

As 225 to 272|25; 7 Z 272|25
So are 7, to 8|47. 225 8|47

THE RVLE OF THREE AFTER A triplicated Proportion.

THis Rule concerns proportions between lines and ſolids, wherein the lines given muſt be multiplyed Cubically, and then the ſecond number multiplyed into the third, and that product divided by the firſt, and the quotient gives the demand.

The uſe of it, is to finde the diameter and weight of any bullet of iron, lead, or other metall.

1 *Having the diameter and weight of one iron bullet, and the diameter of another, to finde the weight of the ſecond bullet.*

AS the cube of the diameter of the firſt bullet
to the weight thereof;
So the cube of the diameter of the ſecond bullet
to the weight thereof.

So the diameter of one iron bullet, being 4 inches, and the weight 9 pounds: And the diameter of another bullet being 8 inches, the weight thereof will be found to be 72 pounds For,

As

As 64 to 9 : 64 Z 9
So are 512 to 72. 512 Z 72

2 *Having the diameter and weight of one iron bullet, and the weight of another, to finde the diameter of the ſecond bullet.*

AS the weight of the firſt bullet,
is to the Cube of the Diameter thereof;
So is the weight of the ſecond bullet,
to the cube of the Diameter thereof.

So the weight of one iron bullet being 9 pounds, and the diameter 4 inches: And the weight of another being 72 pounds, the Diameter thereof, will be found to be 8 inches. For

As 9 to 64, 9 Z 64
So are 72 to 512 72 Z 512

Then the root of this Cube number 512 being extracted, it will be found to be 8, and ſo many inches is the diameter of that bullet whoſe weight is 72 pounds.

512(8
512
000

THE FIRST PART of the Rule of Practiſe by Multiplication onely.

THis Rule is wrought two ſeverall wayes, namely by Multiplication onely, or by Diviſion onely. It differeth and is diſtinguiſhed from the Rule of Three, by having 1 in the firſt, ſecond or third place.

When 1 is in the firſt place, it is wrought by Multiplication onely.

And when 1 is in the ſecond or third place, it is wrought by Diviſion onely.

Becauſe we will not mix one way of operation, with another, we have divided this Rule into three parts, the firſt whereof having 1 in the firſt place, is wrought by Multiplication onely, as before is ſhewed.

The uſe whereof is, that having the price of one yard of cloth, lace, or ſuch like, or the price of one pound, or one ounce, of any wares or merchandize, to find the price of any number of yards, pounds, or ounces. And for other uſes, as the examples will manifeſt.

1 *Ha-*

1 *Having the price of one yard of Kerſey, to finde what* 100 *yards will coſt.*

AS 1 yard, to the price thereof;
So are 100 yards, to the price thereof.

So if one yard of Kerſey coſt 3 ſhillings 4 pence 2 farthings, 100 yards after the ſame rate will coſt 16 pounds, 17 ſhillings, 6 pence. For,

As 1 to 16875	1 | 16875
So are 100 to 1687500	100 | 1687500

2 *Having the price of one yard of Riband, to finde what* 1000 *yards will coſt.*

AS one yard, to the price thereof:
So are 1000 yards, to the price thereof.

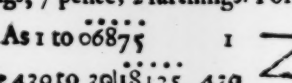
So if 1 yard of Riband, coſt 7 pence, 3 farthings, 1000 yards will coſt 32 pounds, 5 ſhillings, 10 pence, 1 farthing. For,

As 1 to 032292	1 | 032292
So 1000 to 32292000	1000 | 32292000

3 *Having the price of one yard of lace, to finde what any number of yards will coſt.*

AS 1 yard is to the price thereof;
So are 439 yards, to the price thereof.

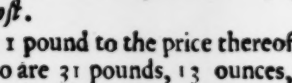
So if one yard of lace coſt 1 ſhilling, 4 pence, 2 farthings: 439 yards will coſt 30 pounds, 3 ſhillings, 7 pence, 2 farthings. For,



4 *Having the price of one pound of ſilk, to find what any number of pounds will coſt.*

AS 1 pound to the price thereof;
So are 31 pounds, 13 ounces, to the price thereof.

So if 1 pound of ſilk, coſt 1 pound, 12 ſhillings, 8 pence, 1 farthing; 31 pounds and 13 ounces wil coſt 51 pounds, 19 ſhillings, 10 pence 2 farthings. For,



Note that the pound of ſilk conteins 16 ounces, therefore (according to the 9th rule, divide 12, adding Cyphers, by 16, and the quotient will give you the artificiall numbers for 13 oun.

5 *Ha-*

5 *Having the price of one pound of Mace, or of any other Merchandize, to finde what any other number of pounds will coſt.*

AS 1 pound of Mace, to the price thereof;
So are 356 pounds, to the price thereof.

So if one pound of Mace coſt 6 ſhillings, 356 pounds will coſt 106 pounds, 16 ſhillings. For,

As 1 to 3	1 — 3
So are 356 to 106,8	356 — 106|8

6 *Having the ſum allowed, for factorage, in one pound, to finde what the factorage will amount unto in any other ſumme.*

AS 1 pound, to the factorage thereof:
So are 1345 pounds, to the factorage thereof.

So if a Merchant allow his Factor 6 pence, 2 farthings for factorage in one pound, it will amount to 33 pounds, 8 ſhillings, 6 pence, 1 farthing, for factorage in 1345 pounds. For,

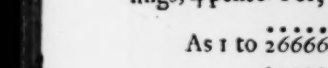
As 1 to 027083	1 — 027083
So 1345 to 35|4266	1345 — 35|4266

7 *Ha-*

7 *Having the price of one ounce of plate, to find what any other number of ounces will coſt.*

AS 1 ounce of plate, to the price thereof;
So are 175 ounces, to the price thereof.

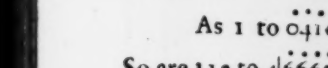
So if one ounce of plate coſt 5 ſhillings, 4 pence, 175 ounces will coſt 46 pounds, 13 ſhillings, 4 pence. For,



8 *Having the price of one pound of Sugar, to finde what a hundred weight will coſt.*

AS 1 pound weight, to the price thereof;
So is 1 hundred weight to the price thereof.

So if one pound of Sugar coſt 10 pence, 1 hundred weight will coſt 4 pounds, 13 ſhillings 2 pence. For,



Note that of Sugar, Pepper, Currants, Raiſins, and all other garbleable commodities, 112 pounds make one hundred weight.

9 *Ha-*

9. *Having the price of 100 weight of Nutmegs, or any other commodity, to finde what any other quantity of hundreds will cost.*

AS 1 is to the price of one hundred weight: So are 14 hundred weight, $\frac{1}{4}$ and $\frac{1}{8}$ to the price thereof.

So if 1 hundred weight of Nutmegs, cost 22 pounds, 8 shillings; 14 hundred, $\frac{1}{4}$ and $\frac{1}{8}$ will cost 322 pounds. For,

As 1 to 22|$\dot{4}$ 1 Z 22|$\dot{4}$

So 14|$\dot{3}\dot{7}\dot{5}$ to 3$\dot{2}$2|$\dot{0}\dot{0}\dot{0}\dot{0}$ 14|$\dot{3}\dot{7}\dot{5}$ 322|$\dot{0}\dot{0}\dot{0}\dot{0}$

THE

THE SECOND Part of the Rule of *PRACTISE*, by Division onley, having 1 in the second place.

THe use of this part of this Rule among others is, if a Merchant be desirous to lay out a certain summe of money, and no more, in any sort of Merchandize, then knowing the price of one hundred, or one pound weight, to finde how many hundreds or pounds he may buy for that money, that he over-buy not himself.

How to divide whole numbers and fractions by whole numbers and fractions, and likewise whole numbers onely, by whole numbers and fractions, and by fractions onely, is fully shewed in the 14, 15, 16. and 17 Rules, whereto we referre the Practitioner, and onely set down the questions and answers together with the Proportions.

1 *Ha-*

1 *Having the price of any hundred weight of any Merchandize, to finde what quantity any other sum of money will buy.*

AS the price of one hundred weight, is to 1:

So are 133 pounds, 10 shillings, to 21 hundred, $\frac{1}{4}$ and 12 pound.

So if 6 pounds, 5 shillings, will buy 1 hundred weight of Almonds, 133 pounds, 10 shillings will buy 21 hundred, $\frac{1}{4}$ and 12 pounds weight. For,

As 6|25 to 1; 6|25 Z 1

So are 133|5 to 21|36 133|5 21|36

The content of the fraction is found by the sixt rule.

2 *Having the price of one pound weight of any Merchandize, to find what quantity any other summe of money will buy.*

AS the price of one pound weight is to 1;

So are 97 pounds, to 4656 pounds weight.

So if 5 pence, will by 1 pound of Currants, 97 pounds will buy 4656 pounds weight, and 1 ounce. For,

As 020833 to 1 020833 Z 1

So 97 to 4656|074497 97 4656|074497

3 H-

3 *Having the price of one Ell of Holland cloth, to finde how many Ells any other ſumme of money will buy.*

AS the price of one ell, is to 1 :
So are 14 pounds, to 86 els and $\frac{1}{3}$ a quarter.

So if 3 ſhillings, 3 pence will buy one ell of holland cloth, 14 pounds will buy 86 els, $\frac{1}{3}$ a quarter, and about $\frac{1}{45}$ part of an ell. For,

As 1625 to 1 ; 1625 Z 1
So are 14 to 86|1538 14 86|1538

So alſo if 12 pounds, 10 ſhillings, will buy one piece of broad-cloth, 345 pounds will buy 27 pieces, $\frac{1}{2}$ and $\frac{1}{10}$ part of a cloth. For,

As 12|5 to 1 : 12|5 Z 1
So are 345 to 27|60 345 27|60

4 *Having the value of one half crown, to find how many half crowns there are, in any ſumme of money.*

AS 2 ſhillings, 6 pence, is to 1 ;
So are 85 pounds, to the half crowns therein.

So

So if 2 ſhillings 6 pence, be the value of one half crown, there will be found 680 half crowns in 85 pounds. For,

As 125 to 1;	125 Z 1
So are 85 to 680,	85 Z 680

5 *Having the worth of one Flemiſh pound in Engliſh money, to finde how many pounds Flemiſh there are in any ſumme Engliſh.*

AS the value of one pound Flemiſh, is to 1; So are 85 pounds Engliſh, to the Flemiſh pounds therein.

So if 12 ſhillings, 6 pence Engliſh, be the value of one pound Flemiſh, you ſhall finde 136 pounds Flemiſh, in 85 pounds Engliſh. For,

As 625 to 1;	625. Z 1
So are 85 to 136.	85 Z 136

THE

THE THIRD Part of the Rule of *PRACTISE*, by Division onely, having 1 in the third place

THe use of this third part is, to find the price of 1 yard, 1 ell, 1 pound weight, &c. having the price of any greater number of yards, els, pounds, &c. given.

In the 13th Rule aforegoing, we have shewed how to divide by an unit, and in the 14, 15, 16, 17 Rules, to divide whole numbers by whole numbers, and whole numbers, by whole numbers and fractions, and whole numbers and fractions, by whole numbers and fractions, and all or any of them by a fraction onely, therefore we will forbear to repeat the same, and set down the questions and answers together, with the Proportions, as formerly.

1 *Having the price of* 100 *yards of Kersey, to find the price of one yard.*

AS 100 yards, to the price thereof:
So is one yard, to the price thereof.

So

So if 100 yards of Kerſey coſt 16 pounds, 17 ſhillings, 6 pence, 1 yard will be found to coſt 3 ſhillings, 4 pence, 2 farthings. For,

As 100 to 16|875 — 100 Z 16|875
So is 1 to 16875 — 1 Z 16875

2 *Having the price of* 1000 *yards of Riband, or any ſuch wares, to find what one yard will coſt.*

AS 1000 yards, to the price thereof;
So is 1 yard to the price thereof.

So if 1000 yards of Riban coſt 32 pounds, 5 ſhillings, 10 pence, 1 farthing, 1 yard will coſt 7 pence, 3 farthings. For,

As 1000 to 32|292; — 1000 Z 32|292
So is 1, to 032292 — 1 Z 032292

Note that theſe two examples are proofs of the two firſt, in the firſt part of this Rule.

3 *Having the price of one hundred weight of any ſort of Merchandice, to finde the price of one pound weight.*

AS one hundred weight, to the price thereof
So is 1 pound weight, to the price thereof:
So if one hundred weight of Almonds coſt 7 pounds; 1 pound weight will be found to coſt 1 ſhilling, 3 pence. For,

As 112 to 7;	112		7
So is 1 to 0625	1	Z	0625

So alſo if 1 hundred weight of Cochinelle coſt 160 pounds, 1 pound will coſt 1 pound, 8 ſhillings, 6 pence, 3 farthings. For,

As 112, to 160;	112		160
So is 1 to 1|42857	1	Z	1|42857

4 *Having the price of any number of yards of cloth to finde what one yard will coſt.*

AS the number of yards, to the price thereof;
So is 1 yard, to the price the thereof:
So if 20 yards of Scarlet coſt 77 pounds, 10 ſhillings, 1 yard, will coſt 3 pounds, 17 ſhillings, 6 pence. For;

As

As 20 to 77|5	20	Z	77|5
So is 1 to 3|875	1		3|875

5 *Having the price of any quantity of pounds of any Wares or Merchandize, to find the price of one pound weight.*

AS the number of pounds weight to the price thereof.

So is 1 pound weight, to the price thereof.

So if 57 pounds of pepper coſt 3 pounds, 10 ſhillings; 1 pound, will coſt 1 ſhillings, 2 pence 3 farthings. For,

As 57 to 3|5	57	Z	3|5
So is 1 to 06140	1		06140

THE Rule of *Proportion.*

THis Rule is no other than the Rule of Three, and it is called the Rule of Proportion, becauſe if three numbers be given, it will finde a fourth, a fift, a ſixt, &c. in continuall Proportion, as is formerly ſhewed.

The uſes thereof are 5. The firſt is, to find what any ſumme of money to be paid at the end of 1,2,3,4,5, or more years, with uſe upon uſe will increaſe unto.

The ſecond is, to find what any ſumme of money at the end of 1,2,3,4,5, or more years, abating uſe upon uſe will decreaſe unto.

The third is, to finde the preſent worth of 100 pounds, or any other ſum of money, to be paid at the end of 20 years, or any ſhorter time.

The fourth is, to find in how many years 100 pound, or any other ſum wil be paid by 8 pound or any ſum by the year, allowing uſe beſides.

And the fift is, to find the true and preſent worth of any office, leaſe, yearly penſion, or annuity, to continue for any term of years: and the ſolution of all difficult queſtions of that nature.

USE

USE I.

1 *Having* 100 *pounds and the uſe thereof given, to finde what it will increaſe unto in* 20 *years, or any ſhorter time, with uſe upon uſe.*

SO if 8 pounds be the uſe of 100 pounds for one year, the firſt years encreaſe will be 108 pounds.

Then for the ſecond years increaſe.

As 100 pounds, to the uſe thereof;
So 108 pounds to the uſe thereof.

So the uſe of 100 pounds being 8 pounds, the uſe of 108 pounds will be found to be 8 pounds, 12 ſhillings, 9 pence, 3 farthings. For,

As 100 to 8;	100	8
So are 108 to $8\vert\dot{6}\dot{4}$	108	$8\vert\dot{6}\dot{4}$

Which $8\vert\dot{6}\dot{4}$ being added to 108, makes $116\vert\dot{6}\dot{4}$, and ſuch is the ſecond years increaſe.

Then for the third years increaſe.

As 100 pounds to the uſe thereof;

So $116\vert\dot{6}\dot{4}$ to the uſe thereof.

So the uſe of 100 pounds, being 8 pounds, the uſe of 116 pounds, 12 ſhillings, 9 pence 3 farthings will be found to be 9 pounds, 6 ſhillings, 7 pence, 2 farthings. For,

As 100 to 8; 100 Z 8

So are 116|64 to 9|3312 116|64 Z 9|3312

Which being added to 116|64 makes 125|9712 and ſuch is the third years increaſe.

And ſo multiplying and dividing, and adding the yearly uſe as before, the 20th, years increaſe will be found to be 466|094196, in coyn 466 pounds, 1 ſhilling, 10 pence, 3 farthings, and ſuch is the ſumme that 100 pounds, will increaſe unto in 20 years with uſe upon uſe according to the rate propoſed.

But to avoid the trouble of ſo many additions, and to find both principall and uſe of every yeare, at one operation, worke by theſe proportions.

As 100 pounds,
to 100 pounds and the uſe;
So the principall or ſumme given,
to the firſt years increaſe,

So the uſe of 100 pounds being 8 pounds, *per Annum*, and the principall or ſum given 100 pounds, the firſt years increaſe will be found to be 108 pounds. For,

As

As 100 to 108; 100 Z 108
So is 100 to 108. 108 Z 108

Then for the ſecond years increaſe,

As 100 pounds,
to 100 pounds, and the uſe;
So is the firſt years increaſe,
to the ſecond years increaſe.

So the firſt years increaſe being 108 pounds, the ſecond years increaſe will be found to be 116 pounds, 12 ſhilllings 9 pence, 3 farthings. For,

As 100 to 108 100 Z 108
So is 108 to 116|64 108 Z 116|64

Then for the third years increaſe.

As 100 pounds,
to 108 pounds;
So is the ſecond years increaſe,
to the third years increaſe.

So the ſecond years increaſe being 116 pounds, 12 ſhillings, 9 pence, 3 farthings, the third yeares increaſe will be found to be 125 pound, 19 ſhillings, 5 pence, 1 farthing. For,

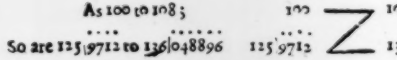
As 100 to 108; 100 Z 108
So 116 64 to 125|9712 116|64 Z 125|9712

Then

Then for the fourth years increaſe.

As 100 pounds,
to 108 pounds;
So is the third years increaſe,
to the fourth years increaſe.

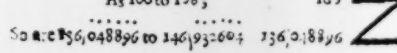
So the third years increaſe being 125 pounds 19 ſhillings, 5 pence, 1 farthing; the fourth years increaſe will be found to be 136 pounds, 11 pence, 3 farthings. For,



Then for the fift years increaſe.

As 100 pounds,
to 108 pounds;
So the fourth years increaſe
to the fift years increaſe.

So the fourth years increaſe being 136 pounds, 11 pence, 3 farthings; the fift years increaſe will be found to be 146 pounds, 18 ſhillings, 7 pence, 3 farthings, For,



And

And in this manner multiplying and dividing, you ſhall find the 20th years increaſe to be 466|094196, which is in coyn 466 pounds, 1 ſhilling, 10 pence, 3 farthings, as before.

2 *Having* 100 *pounds, and the uſe thereof for one year, and another ſum given, to find what the ſecond ſumme will increaſe unto in* 20 *years, or any other time, with uſe upon uſe at the rate propoſed.*

As 100 pounds,
to 100 pounds and the uſe;
So the principall or ſum given,
to the firſt years increaſe.

So the uſe of 100 pounds, being 8 pounds *per annum*, and the principall or ſumme given 45 pounds, the firſt years increaſe will be found to be 48 pounds, 12 ſhillings. For,

As 100 to 108 — 100 — 108
So are 45 to 48|60 — 45 — 48|60

Now for the ſecond years increaſe.
As 100 pounds,
to 108 pounds;

So

So the firſt years increaſe,
to the ſecond years increaſe.

So the firſt years increaſe, being 48 pounds, 12 ſhillings; the ſecond years increaſe will be found to be 52 pounds, 9 ſhillings, 9 pence, 1 farthing. For,

As 100 to 108 100 Z 108
So are 48|60 to 52|4880 48|60 Z 52|4880

Then for the third years increaſe.

As 100 pounds,
to 108 pounds;
So the ſecond years increaſe,
to the third years increaſe.

So the ſecond years increaſe being 52 pounds, 9 ſhillings, 9 pence, 1 farthing; the third years increaſe will be found to be 56 pounds, 13 ſhillings, 9 pence. For,

As 100 to 108 100 Z 108
So 52|4880 to 56|6870 52|4880 Z 56|6870

Then for the fourth years increaſe.

As

As 100 pounds,
to 108 pounds;
So the third years increaſe,
to the fourth years increaſe.

So the third years increaſe being 56 pounds, 13 ſhillings, 9 pence; the fourth years increaſe will be found to be 61 pounds, 4 ſhillings, 5 pence, 2 farthings. For

As 100 to 108; 100 Z 108
So is 56|6870 to 61|220 56|6870 Z 61|2220

Then for the fift years increaſe.

As 100 pounds,
to 108 pound;
So the fourth years increaſe,
to the fift years increaſe.

So the fourth years increaſe being 61 pounds 4 ſhillings, 5 pence, 2 farthings, the fift years increaſe will be found to be 66 pounds, 2 ſhillings, 4 pence, 3 farthings. For,

As

As 100 to 108; 100 Z 108

So 61|2220 to 66|1197 61|2220 Z 66|1197

Then for the ſixt years increaſe.

As 100 pounds
to 108 pounds;
So the fift years increaſe,
to the ſixt years increaſe.

So the fifth years increaſe being 66 pounds, 2 ſhillings, 4 pence, 3 farthings; the ſixt years increaſe will be found to be 71 pounds, 8 ſhillings, 2 pence, 1 farthing. For,

As 100 to 108 100 Z 108

So 66|1197 to 71|4093 66|1197 Z 71|4093

Laſtly, for the ſeventh years increaſe.

As 100 pounds,
to 108 pounds;
So the ſixt years increaſe,
to the ſeventh years increaſe.

So the ſixt years increaſe, being 71 pounds, 8 ſhillings, 2 pence, 1 farthing; the ſeventh years increaſe will be found to be 77 pounds, 2 ſhillings, 5 pence, 2 farthings. For,

As

As 100 to 108 100 Z 108

So 71|4093 to 77|1200 71|4093 Z 77|1220

And ſo it appears that 45 pounds with uſe upon uſe after the rate of 8 pounds in the 100 pounds, in ſeven years time, will increaſe unto 77 pounds, 2 ſhillings, 5 pence, 2 farthings.

And thus you may finde what any other ſumme at any rate propoſed will increaſe unto in any time.

USE II.

1 *Having* 100 *pounds and the uſe thereof given, to finde what it will decreaſe unto into* 20, *or any other time, abating uſe upon uſe.*

As 100 pounds and the uſe,
is to 100 pounds;
So is 100 pounds
to the firſt years decreaſe.

So the principall ſumme being 100 pounds, and the uſe 8 pounds in the 100, the firſt years decreaſe will be found to be 92 pounds, 11 ſhillings, 10 pence, 1 farthing. For,

As 108 to 100, 108 Z 100

So is 100 to 92|592592 100 Z 92|592592

Then for the ſecond years decreaſe.

As 108 pounds,
to the firſt years decreaſe; So

So is 100 pounds,
to the ſecond years decreaſe.

So the firſt years decreaſe being 92 pounds, 11 ſhillings, 10 pence, 1 farthing: the ſecond years decreaſe will be found to be 85 pounds, 14 ſhillings, 8 pence. For,

As 108 to 92|592592 108 Z 92|592592
So is 100 to 85|733881 100 Z 85|733881

Then for the third years decreaſe:

As 108 pounds,
to the ſecond years decreaſe;
So is 100 pounds,
to the third years decreaſe.

So the ſecond years decreaſe being 85 pounds 14 ſhilings, 8 pence; the third years decreaſe will be found to be 79 pounds, 7 ſhillings, 8 pence. For,

As 108 to 85|733881 108 Z 85|733881
So is 100 to 79|383223 100 Z 79|383223

Then for the fourth years decreaſe.

As 108 pounds,
to the third years decreaſe;
So is 100 pounds,
to the fourth years decreaſe.

So the third years decreaſe being 79 pounds 7 ſhillings, 8 pence, the fourth years decreaſe will be found to be 73 pounds, 10 ſhillings, 2 farthings. For,

As

As 108 to 79|383223 108 Z 79|383223
So 100 to 73|502984 100 Z 73|502984

Then for the fifth years decreaſe.

As 108 pounds, to the fourth years decreaſe;
So is 100 pounds, to the fifth years decreaſe.

So the fourth years decreaſe being 73 pounds, 10 ſhillings, 2 farthings, the fift years decreaſe will be found to be 68 pounds, 1 ſhilling, 2 pence. For,

As 108 to 73|502984 108 Z 79|383223
So 100 to 68|058318 100 Z 68|058318

Then for the ſixt years decreaſe.

As 108 pounds, to the fift years decreaſe;
So is 100 pounds, to the ſixt years decreaſe.

So the fift years decreaſe being 68 pounds, 1 ſhilling, 2 pence; the ſixt years decreaſe will be found to be 63 pounds, 4 pence. For,

As 108 to 68|058318 108 Z 68|058318
So is 100 to 63|016961 100 Z 63|016961

Laſtly, for the ſeventh years decreaſe.

As 108 pounds,
to the ſixt years decreaſe,
So is 100 pounds,
to the ſeventh years decreaſe.

So

So the ſixt years decreaſe being 63 pounds, 4 pence, the ſeventh years decreaſe will be found to be 58 pounds, 7 ſhillings. For,

As 108 to 63|016961 108 — 63|016961
So 100 to 58|349037 100 — 58|349037

And thus multiplying and dividing, you ſhall find the 20th. proportionall decreaſe to be 21|454815, which is in coyn 21 pounds, 9 ſhillings, 1 penny, and ſuch is the ſumme that 100 pounds will decreaſe unto in 20 years at the rate propoſed.

2 *Having* 100 *pounds, and the uſe thereof, for one year, and any other ſum given, to finde what the other ſum wil decreaſe unto in* 20 *years, or ſhorter time abating uſe upon uſe yearly.*

AS 100 pounds and the uſe,
is to the ſumme given;
So is 100 pounds,
to the firſt years decreaſe.

So if 8 pounds be the uſe of 100 pounds for one year, and 77 pounds, 2 ſhillings, 5 pence, 2 farthings the ſumme given, the firſt years decreaſe will be found to be 71 pounds, 8 ſhillings, 2 pence, 1 farthing. For,

As 108 to 77|122092 108 — 77|122092
So is 100 to 71|409344 100 — 71|409344

Then

Then for the ſecond years decreaſe.

As 108 pounds,
to the firſt years decreaſe;
So is 100 pounds,
to the ſecond years decreaſe.

So the firſt years decreaſe being 71 pounds, 8 ſhillings, 2 pence, 1 farthing; the ſecond years decreaſe will be found to be 66 pounds, 2 ſhillings, 4 pence, 3 farthings. For,

As 108 to 71|409:44 108 Z 71|409:44
So 100 to 66|119763 100 Z 66|119763

Then for the third years decreaſe.

As 108 pounds,
to the ſecond years decreaſe;
So is 100 pounds,
to the third years decreaſe.

So the ſecond years decreaſe being 66 pounds, 2 ſhillings, 4 pence, 3 farthings, the third years decreaſe will be found to be 61 pounds, 4 ſhillings, 5 pence, 2 farthings. For,

As 108 to 66|119763 108 Z 66|119763
So 100 to 61|222003 100 Z 61|222003

Then for the fourth years decreaſe.

As 108 pounds,
to the third years decreaſe;

So is 100 pounds;
to the fourth years decreaſe.

So the third years decreaſe being 61 pounds 4 ſhillings, 5 pence, 2 farthings, the fourth years decreaſe will be found to be 56 pounds, 13 ſhillings, 9 pence. For,

As 108 to 61|222003 108 Z 61|222003
Sois 100 to 56|687040 100 Z 56|687040

Then for the fift years decreaſe,
As 108 pounds,
to the fourth years decreaſe;
So is 100 pounds,
to the fift years decreaſe.

So the fourth years decreaſe being 56 pounds, 13 ſhillings 9 pence; the fift years decreaſe will be found to be 52 pounds, 9 ſhillings, 9 pence, 1 farthing. For,

As 108 to 56|687040; 108 Z 56|687040
So is 100 to 52|488000. 100 Z 52|488000

Then for the ſixt years decreaſe.
As 108 pounds,
to the fift years decreaſe,
So is 100 pounds,
to the ſixt years decreaſe.

So the fift years decreaſe being 52 pounds, 9 ſhillings, 9 pence, 1 farthing; the ſixt years de-

decreaſe will be found to be 48 pounds, 12 ſhillings. For,

As 108 to 52|488000 108 — 52|488000
So is 100 to 48|600000 100 — 48|600000

Laſtly, for the ſeventh years decreaſe.

As 108 pounds,
to the ſixt years decreaſe,
So is 100 pounds,
to the ſeventh years decreaſe.

So the ſixt years decreaſe being 48 pounds, 12 ſhillings, the ſeventh years decreaſe will be found to be 45 pounds, For,

As 108 to 48|600000 108 — 48|600000
So is 100 to 45|000000 100 — 45|000000

Note, that this is the proof of the ſecond example in the yearly proportionall increaſe.

USE III.

1 *Having* 100 *pounds, and the uſe, together with the time when the ſame is due to be paid, to find the preſent worth thereof.*

THis preſent worth may be found two ways. The firſt way is by the yearly proportionall

decreaſe, as is evident by the examples in the ſecond uſe of this Rule; where the firſt years decreaſe of 100 pounds, is found to be 92 pounds, 11 ſhillings, 10 pence, 1 farthing, and ſuch is the preſent worth of 100 pounds, due to be paid at the end of one year, abating uſe after 8 pounds, *per Cent.*

The ſecond years decreaſe of 100 pounds, is likewiſe found to be 85 pounds, 14 ſhillings, 8 pence, which is the preſent worth of 100 pounds, to be paid at the end of two years.

And the fifth years decreaſe of 100 pounds, is 68 pounds, 1 ſhilling, 2 pence, which is the preſent worth of 100 pounds, due at the end of 5 years. And ſo of others.

2 *Having* 100 *pounds, and the uſe, and any other ſumme given, together with the time when it is due to be paid, to finde the preſent worth thereof.*

As 100 pounds and the uſe,
to the ſumme due:
So is 100 pounds,
to the preſent worth thereof.

So if 45 pounds be due to be paid at the end of one year, the preſent worth thereof abating uſe after 8 pounds *per Cent.* will be found to be 41 pounds, 13 ſhillings, 4 pence. For,

As

As 108 to 45; 108 Z 45

So is 100 to 41|666666 100 Z 41|666666

Or otherwiſe according to the Golden Rule, which is the ſecond way, thus.

As 100 pounds,
to the preſent worth thereof;
So is 45 pounds,
to the preſent worth thereof.

So the preſent worth of 100 pounds due at the end of one year being 92 pounds, 11 ſhillings, 10 pence, 1 farthing; the preſent worth of 45 pounds due alſo at the end of one year, will be found to be 41 pounds, 13 ſhillings, 4 pence, as before. For,

As 100 to 92|592592 100 Z 92|592592

So 45 to 41|666640 45 Z 41|666666

So alſo if the preſent worth of 100 pounds, due at 5 years end be 68 pounds, 1 ſhilling 2 pence; the preſent worth of 355 pounds, due at the end of the like term of 5 years, will be found to be 241 pounds, 12 ſhillings, 1 penny, 3 farthings. For,

As 100 to 68|058318; 100 Z 68|058318

So 355 to 241|60702890 355 Z 241|607028

In this manner have the preſent worth of 100 pounds, due at the end of any term of years

you may readily find the preſent worth of any other ſumme.

USE IV.

1 *Having* 100 *pounds, and the uſe, to find in what time, it will be paid by* 20 *pounds a year allowing uſe beſides.*

As 100 pounds,
to 100 pounds and the uſe;
So is 100 pounds,
to the firſt years principall and uſe.

So if 100 pounds be the ſumme owing, and the uſe thereof 8 pounds, the firſt years principall and uſe will be found to be 108 pounds. For,

As 100 to 108 — 100 — 108
So is 100 to 108 — 100 — 108

From which 108, ſubſtract 20 pounds, reſts 88. Then for the ſecond years principall and uſe.

As 100 pounds,
to 108 pounds,
So the ſecond years principall,
to the ſecond years principall and uſe.

So the ſecond years principal being 88 pound, the ſecond years principall and uſe will be found to be 95 pounds, 9 pence, 3 farthings. For,

As

As 100 to 108 — 100 — 108
So is 88 to 95|04 — 88 — 95|04

Then from 95|04 ſubſtract 20, reſts 75|04

Now for the third years principall and uſe.

As 100 pounds,
to 108 pounds;
So the third years principall,
to the third years principall and uſe.

So the third years principall being 75 pounds, 9 pence, 3 farthings, the third years principall and uſe will be found to be 81 pounds, 10 pence, 2 farthings. For,

As 100 to 108 — 100 — 108
So is 75|04 to 81|0432 — 75|04 — 81|0432

From which ſubſtract 20, reſts 61|0432

Then for the fourth years principall and uſe.

As 100 pounds,
to 108 pounds;
So the fourth years principall,
to the fourth years principall and uſe.

So the fourth years principall being 61 pounds, 10 pence, 2 farthings; the fourth years principall and uſe will be found to be 65 pounds, 18 ſhillings, 6 pence, 1 farthing. For,

As

As 100 to 108; 100 Z 108
So is 61|0432 to 65|926656 61|0432 Z 65|926656

From which ſubſtract 20 reſts 45 926656
Then for the fift years principall and uſe
As 100 pounds,
to 108 pounds,
So the fift years principall,
to the fift years principall and uſe.

So the fift years principall being 45 pounds, 18 ſhillings, 6 pence 1 farthing, the fift years principall and uſe wil be found to be 49 pounds 12 ſhillings. For,

As 100 to 108 100 Z 108
So is 45|926656 to 49|600788 45|926656 Z 49|600788

Then for the ſixt years decreaſe.
As 100 pounds,
to 108 pounds;
So the ſixt years principall,
to the ſixt years principall and uſe.

So the ſixt years principall being 29 pounds, 12 ſhillings, the ſixt years principall and uſe will be found to be 31 pounds, 19 ſhillings, 4 pence, 2 farthings. For,

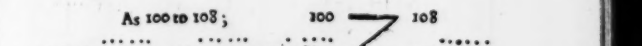
As 100 to 108; 100 Z 108
So is 29|600788 to 31|968851 29|600788 Z 31|968851

From

From which ſubſtract 20, reſts 11|968851
Then for the ſeventh years principall and uſe.

As 100 pounds,
to 108 pounds;
So the ſeventh years principall,
to the ſeventh years principall and uſe.

So the ſeventh years principall being 11 pounds, 19 ſhillings. 4 pence 2 farthings; the ſeventh years principall and uſe will be found to be 12 pounds, 18 ſhillings, 6 pence, 1 farthing. For,



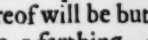
So it appears that this debt of 100 pounds, will be paid in ſeven years, by 20 pounds a year allowing uſe beſides, and that the laſt payment thereof will be but 11 pounds, 18 ſhillings, 6 pence. 1 farthing.

2 *Having* 100 *pounds, and the uſe, and another ſumme given, to finde in what time that ſumme will be paid by* 8 *pounds by the year, allowing uſe beſides.*

As 100 pounds,
to 108 pounds, and the uſe thereof;
So

So the ſumme given,
to the principall and uſe thereof.

So if 25 pounds, be the principall ſumme owing, and the uſe after 8 pounds *per Centum*, it will be paid in 4 years, the laſt payment whereof will be but 5 pounds, 19 ſhillings, 3 pence, 1 farthing; and the firſt years principall and uſe will be 27 pounds. For,

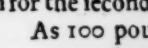


As 100 to 108; 100 — 108
So is 25 to 27. 25 — 27

From which ſubſtract 8, reſts 19 pounds. Then for the ſecond years principall and uſe.

As 100 pounds,
to 108 pounds,
So the ſecond years principall,
to the ſecond years principall and uſe.

So the ſecond years principall being 19 pounds; the ſecond years principall and uſe will be found to be 20 pounds, 10 ſhillings, 5 pence. For,



As 100 to 108; 100 — 108
So is 19 to 20|52. 19 — 20|52

From which ſubſtract 8, reſts 12|52

Then for the third years increaſe.
As 100 pounds,
to 108 pounds;

So

So the third years principall,
to the third years principall and uſe.

So the third years principall being 12 pounds 10 ſhillings, 5 pence, the ſame years principall and uſe will be found to be 13 pounds, 10 ſhillings, 3 pence, 1 farthing. For,

As 100 to 108; 100 Z 108
So is 12|52 to 13|5216 12|52 Z 13|5216

From whence ſubſtract 8, reſts 5|5216

Laſtly, for the fourth years principall and uſe.

As 100 pounds,
to 108 pounds;
So the fourth years principall,
to the fourth years principall and uſe.

So the fourth years principall being 5 pounds 10 ſhillings, 5 pence, 1 farthing; the principall and uſe for the ſame year, will be 5 pounds, 19 ſhillings, 3 pence, 1 farthing. For,

As 100 to 108; 100 Z 108
So is 5|5216 to 5|9633 5|5216 Z 5|9633

And thus you may find in what time any other ſumme by any yearly payment, and at any uſe will be paid.

USE

USE V.

1 *Having the profit of any office, leaſe, yearly penſion, or annuity, and the years it is to continue, to find the preſent worth thereof.*

THere are 2 wayes to work this Propoſition. The firſt way is this, Adde to 100 pounds the uſe, whatſoever it be; whether 6, 8, or 10 pounds, as here we ſuppoſe it to be 8, which added to 100 makes 108, the principall and uſe for the firſt year, then multiply that by 108, and the product is the ſecond years both principall and uſe, and that product multiplyed again by 108, gives the third both principall and uſe; and ſo work for the whole term of years, that any Leaſe, Annuity, Penſion, or ſuch like is to endure, and the laſt product is the diviſor; but if it exceed 7 figures, then cut off all but 7, for 7 figures are ſufficient for the diviſor.

The dividend is found by the Rule of Three. thus, As 8 pounds Annuity or uſe,
to the principall thereof;
So is any other Annuity or uſe,
to the principall thereof.

So the principall of 8 pounds Annuity or uſe being

being 100 pounds, the principall of 60 pounds Annuity or uſe will be found to be 750 pounds. For,

As 8 to 100;
So are 60 to 750.

8 Z 100
60 Z 750

Theſe things premiſed, let the queſtion be to find the preſentworth of an Annuity of 60 ℔ to endure for 5 years, at the rate of 8 pounds in the 100.

The dividend is before found to be 750, whereto adde Cyphers and divide, and the quotient will be 51043-4, which ſubſtract from the

dividend	750	0000
the remain.	510	4374
will be	239	5626

in coyn 239 pounds, 11 ſhillings, 3 pence. And ſuch is the preſentworth of 60 pounds Annuity, to endure for 5 years at the rate propoſed.

108 1 year
108

864
1080

11664 2 year
108

93312
116640

1259712 3 year
108

10077696
12597120

1360488960 4 year
108

10883911168
1360488960

14693280768 5 year

So

So alſo the preſent worth of a Leaſe of 85 pounds, *per Annum*, to endure for 14 years, at the rate of 8 pounds uſe in the 100 pounds, will be found to be 700 pounds, 15 ſhillings, 2 pence, 1 farthing; for multiply 108 the firſt years principall and uſe by 108, and the 14th. product will be 2937187: (but note, that to avoid prolixity) I cut off in every product all but 7 figures, and multiply thoſe as aforeſaid. Then I find the dividend, as before. For,

As 8 pounds annuity or leaſe,
to the principall thereof;
So is 85 pounds annuity or leaſe,
to the principall thereof.

So the principall of 8 pounds annuity or leaſe being 100 pounds; the principall of 85 pounds annuity or leaſe will be found to be 1062 pounds, 10 ſhil-lings. For,

As 8 to 100; 8 Z 100

So is 85 to 1062|5000 85 Z 1062|0500

Then I divide 1062|5000, adding Cyphers by 2937187 and the quotient is 1061|7406
which I ſubſtract from 1062|5000

and there remaines 700|7594 in Coyne 700 pounds, 15 ſhillgins, 2 pence 1 farthing: the preſent worth of a leaſe of 85 pounds

per

per Annum to endure for 14 years at the rate propoſed.

The ſecond way is to finde the yearly proportionall decreaſes that any leaſe, annuity, penſion or office is to endure in ſuch manner, as in the Propoſitions in the ſecond uſe is ſhewed, the totall whereof added together is the preſent worth of every ſuch leaſe, annuity, penſion, or office.

1 *Having* 100 *pounds, and the uſe, and the yearly worth of an office given, together with the time it is to continue, to finde the preſent worth thereof.*

As 100 pounds and the uſe,
to the yearly worth of the office;
So is 100 pounds,
to the firſt years decreaſe.

So if the uſe of 100 pounds for one year, be 8 pounds, and the yearly worth of an office 40 pounds, the firſt years decreaſe will be found to be 37 pounds, 9 pence. For,

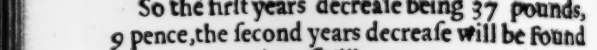
As 108 to 40 108 Z 40
So is 100 to 37|037037 100 Z 37|037037

Then for the ſecond years decreaſe.

As 108 pounds,
to the firſt years decreaſe;
So is 100 pounds,
to the ſecond years decreaſe.

So

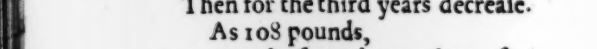
So the firſt years decreaſe being 37 pounds, 9 pence, the ſecond years decreaſe will be found to be 34 pounds, 5 ſhilliugs, 10 pence, 2 farthings. For,



Then for the third years decreaſe.

As 108 pounds,
to the ſecond years decreaſe;
So is 100 pounds,
to the third years decreaſe.

So the ſecond years decreaſe being 24 pounds 5 ſhillings, 10 pence, 2 farthings, the third years decreaſe will be found to be 31 pounds, 15 ſhillings, 3 farthings. For,



Then for the fourth years decreaſe.

As 108 pounds,
to the third years decreaſe,
So is 100 pounds,
to the fourth years decreaſe.

So the third years decreaſe being 31 pounds 15 ſhillings, 3 farthings; the fourth years decreaſe will be found to be 29 pounds, 8 ſhillings, 1 farthing. For,

As

As 108 to 31|753288	108	31|753288
So is 100 to 29|401192	100	29|401192
The firſt years decreaſe	37	037037
The ſecond years decreaſe.	34	293552
The third years decreaſe.	31	753288
The fourth years decreaſe.	29	401192
The totall whereof is	132	485069

in coyn 132 pounds, 9 ſhillings, 8 pence, 2 farthings, the preſent worth of an office of 40 pounds *per Annum*, to endure for foure years at the rate propoſed.

So alſo the preſent worth of a penſion of 100 pounds a year to continue for 5 years at the rate of 8 pounds *per Centum* uſe, will be found to be 399 pounds, 5 ſhillings, 5 pence, as here appeareth.

92	592592
85	733881
79	383223
73	502984
68	058318
399	270998

Theſe yearly decreaſes are before in the the firſt example of the ſecond uſe, therefore we have onely added them, and found the totall which is the anſwer.

92	592592
85	733881
79	383223
73	502984
68	058318
63	056961
58	349037
520	636996

So likewiſe the true and preſent worth of an annuity of 100 pounds a year, to continue for 7 years, at the rate of 8 pounds in the 100 uſe, will be found to be 520 pounds, 12 ſhillings, 8 pence, 3 farthings.

The yearly decreaſes are formerly found, as is already ſhewed, therefore we onely adde them together, and the totall is the anſwer as before.

And ſo alſo the true and preſent worth of an annuity of 100 pounds by the year, to endure for 14 years will be found to be 824 pounds 8 ſhillings, 5 pence, 3 farthings.

520	636996
54	026886
50	024894
46	319346
42	888283
39	711373
36	769789
34	046100
824	423667

The firſt ſeven years decreaſes, are before found, and above ſet down, and if you multiply and divide, as is before taught, you ſhall finde the other 7 years decreaſes to be as above, the totall whereof is the anſwer.

We told you in the firſt example of the ſecond uſe of this Rule, that the 20th proportionall

nall decreaſe of 100 pounds was 21|454815, which being ſubſtracted from 100|000000 reſts 78|545185 in coyn 78 pounds, 10 ſhillings, 11 pence, the true value or worth of an annuity of 8 pounds to endure for 20 years.

Likewiſe for an annuity, leaſe, yearly penſion, or ſuch like, to endure for 1, 2, 5, 7, or 14, or any other term of years, ſubſtract the yearly decreaſes from 100, and the remainers will give you the true value of or worth of an annuity of 8 pounds, to continue for any ſuch term of years.

Or otherwiſe, take the worth or value of 100 pounds, annuity, leaſe, or penſion (as in the precedent examples) for 5, 7, 14, or more or fewer years, and that worth or value ſhall be your ſecond number in this Rule,

Theſe worths or values thus had, it followes by the third and more excellent way to find the preſent worth of any annuity, leaſe, yearly penſion or office; thus:

1 *Having the worth of an annuity of* 100 *pounds, for any term of years, to find the the preſent worth of any other annuity, for the like term.*

As an annuity of 100 pounds,
to the worth thereof.
So an annuity of 60 pounds,
to the worth thereof.

So if 399 pounds, 5 ſhillings, 5 pence be the preſent worth of an annuity of 100 pounds, to continue for 5 years at the rate of 8 pounds *per Cent.* uſe; the preſent worth of an annuity of 60 pounds for the like term and rate will be found to be 239 pounds, 11 ſhillings, 3 pence. For,

As 100 to 399|27|0998 100 Z 399|27|0998
So 60 to 239|56|2598|80 60 239|56|2598|80

So alſo the preſent worth of an annuity of 100 pounds, to continue for 7 years, at the rate of 8 pounds uſe in the 100, being 520 pounds 12 ſhillings, 8 pence, 3 farthings; the preſent worth of an annuity of 45 pouuds, for the like term and rate will be found to be 234 pounds, 5 ſhillings, 8 pence, 3 farthings. For,

As

As 100 to 520|636996 100 Z 520|636996
So 45 to 234|28664820 45 Z 234|28664820

So alſo the the preſent worth of an annuity of 100 pounds to continue for 14 years at the rate of 8 pounds uſe in the 100, being 824 pounds, 8 ſhillings, 5 pence, 3 farthings, the preſent worth of an annuity of 52 pounds, to continue for the like term, and at the like rate will be found to be 263 pounds, 16 ſhillings 3 pence, 3 farthings. For,

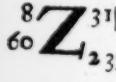
As 100 to 824|423667 100 Z 824|423667
So 32 to 263|81557344 32 Z 263|81557344

2 *Having the preſent worth of an annuity of* 8 *pounds, for any term of years, to find the preſent worth of any other annuity for the like term.*

As an annuity of 8 pounds,
to the worth thereof,
So an annuity of 60 pounds,
to the worth thereof.

So the worth of an annuity of 8 pounds, to continue for 5 years, at the rate of 8 pounds *per Centum* uſe, being 31 pounds, 18 ſhillings, 10 pence, the preſent worth of an annnity of of 60 pounds, to continue for the like term, and at the like rate will be found to be 239 pounds, 11 ſhillings, 3 pence, as before. For,

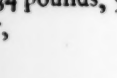
As 8 to 31|941682;
So is 60 to 239|562615.



As an annuity of 8 pounds,
to the worth thereof:
So an annuity of 45 pounds,
to the worth thereof

So the worth of an annuity of 8 pounds to continue for 7 years at the rate of 8 pounds, *per Centum* uſe, being 41 pounds, 13 ſhillings, the preſent worth of an annuity of 45 pounds, to continue for the like term, and at the like rate will be found to be 234 pounds, 5 ſhillings 8 pence, 3 farthings. For,

As 8 to 41|650963
So is 45 to 234|286666

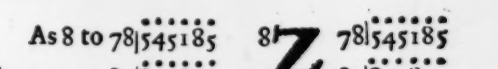


As an annuity of 8 pounds,
to the worth thereof:

So

So is an annuity of 100 pounds,
to the worth thereof.

So the worth of an annuity of 8 pounds, to continue for 20 years, being 78 pounds, 10 ſhillings, 11 pence, at the rate of 8 pounds *per Centum* uſe, the preſent worth of an annuity of 100 pounds for the like term, and at the like rate will be found to be 981 pounds, 16 ſhillings, 3 pence, 2 farthings. For,



The like reaſon and proportions hold for any other rates and times propoſed.

THE

THE Rule of *Fellowſhip*.

THis Rule may fitly be divided into three parts. That is, into *Fellowſhip in Gain*, *Fellowſhip in Loſſe*, and *Fellowſhip in Time*. We will treat of them all in order, and firſt of the firſt, namely *Fellowſhip in Gain*.

The uſe whereof is, to give to each adventurer, his juſt and equall proportion of the money gained.

It is wrought two wayes: The firſt way is by Diviſion and Multiplication (wherein the totall adventured is always the diviſor, and the money gained the dividend) for firſt, they divide the gain by the adventure, and the quotient is the gain of 1 pound: Then by the firſt part of the Rule of Practiſe, they multiply the gain of 1 pound by every mans ſeverall adventure, and the product gives every adventurer his juſt part, and the proportions for it, are,

As 1 pound,
to the gain thereof;
So is every mans perticular adventure,
to every mans perticular gain.

The

The ſecond way is by Multiplication, and Diviſion(according to the firſt way in the Rule of Three,)wherein the whole adventure is likewiſe the Diviſor, and firſt number, the money gained the ſecond number, and every mans perticular adventure, the third number, and the proportions hold thus;

As the whole adventure,
is to the whole gain;
So is every mans perticular adventure,
to every mans perticular gain.

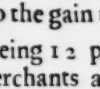
We will give examples, in both theſe wayes, and leave it to every mans pleaſure which to follow.

1 *Having every Merchants perticular adventure, and the gain in one pound, to find every Merchants perticular gain.*

As 1 pound to the gain thereof;
So are 30 pounds to the gain thereof.

So the gain of 1 pound being 12 pounds, 10 ſhillings, and the firſt Merchants adventure 30 pounds, his gain will be found to be 375 pounds. For,

As 1 to 12|5	1	12|5
So is 30 to 375,	30	375



As

As 1 pound to the gain thereof;
So are 50 pounds to the gain thereof.

So the gain of 1 pound being 12 pounds, 10 ſhillings, and the ſecond Merchants adventure 50 pounds, his gain will be found to be 625 pounds. For,

As 1 to 12$\frac{5}{}$	1	12$\frac{5}{}$
So are 50 to 625	50	625

As 1 pound to the gain thereof,
So are 60 pounds to the gain thereof.

So the gain of 1 pound being 12 pounds, 10 ſhillings, and the third Merchants adventure 60 pounds, his gain will be found to be 750 pounds. For,

As 1 to 12$\frac{5}{}$	1	12$\frac{5}{}$
So are 60 to 750	60	750

As 1 pound to the gain thereof;
So are 100 pounds, to the gain thereof.

So the gain of 1 pound being 12 pounds, 10 ſhillings, and the fourth Merchants adventure 100 pounds, his gain will be found to be 1250 pounds. For.

As 1 to 12$\frac{5}{}$	1	12$\frac{5}{}$
So are 100 to 1250	100	1250

2 *Having the whole ſumme adventured, and the whole gain, and likewiſe every Merchants ſeverall adventure, to finde every Merchants ſeverall gain.*

AS the whole adventure, to the whole gain;
So the firſt Merchants adventure, to his gain.

So the whole adventure being 240 pounds, and the whole gain 3000 pounds, and the firſt Merchants adventure 30 pounds; his gain will be found to be 375 pounds. For,

As 240 to 3000 — 240 Z 3000
So are 30 to 375 — 30 Z 375

As the whole adventure, to the whole gain:
So the ſecond Merchants adventure, to his gain

So the whole adventure being 240 pounds, and the whole gain 3000 pounds, and the ſecond Merchants adventure 50 pounds; his gain will be found to be 625 pounds. For,

As 240 to 3000, — 240 Z 3000
So are 50 to 625. — 50 Z 625

As the whole adventure, to the whole gain,
So the third Merchants adventure, to his gain.

So the whole adventure being 240 pounds, and the whole gain 3000 pounds, and the third Mer-

Merchants adventure, 60 pounds, his gain will be found to be 750 pounds. For,

As 240 to 3000	240 Z 3000
So are 60 to 750.	60 Z 750

As the whole adventure, to the whole gain: So the fourth Merchants adventure, to his gain.

So the whole adventure being 240 pounds, and the whole gain 3000 pounds, and the fourth Merchants adventure 100 pounds; his gain will be found to be 1250 pounds. For,

As 240 to 3000	240 Z 3000
So are 100 to 1250	100 Z 1250

The proof for this and all other queſtions of this nature, is to adde every Merchants ſeverall gaines, and the remainer of the diviſions if any be, together, and if the totall bring forth the money gained, it is true, elſe not, as in the example.

375
625
750
1250

3000

Note that in this example, there is no remainer.

3 *Having the ſum three Merchants gained, the ſum the third adventured, and the commodities the ſecond laid in, and likewiſe what parts of the gain the firſt and ſecond Merchants muſt have; to find the third Merchants part of the gain, the money the ſecond Merchants goods were put in for, and how much the firſt Merchant adventured.*

ADde the firſt and ſecond Merchants gain together, and ſubſtract that totall from the ſumme gained, and the remainer is the third Merchants gain. Then,

As the third Merchants gain,
to his money adventured;
So the ſecond Merchants gain,
to the value of his cloth adventured.

So if three Merchants adventure together, and the firſt lay in a ſumme unknown, the ſecond, 20 pieces of cloth, and the third, 500 pounds, and they gain 1000 pounds, whereof the firſt Merchant muſt have 350, and the ſecond 400 pounds, it will be found, (as before is directed) that the third Merchants gain to be 250 pounds, and that the 20 pieces of cloth were laid in for 800 pounds. For,

As

As 250 to 500 — 250 Z 500
So are 400 to 800 — 400 Z 800

As the third Merchants gain,
to his money adventured;
So the firſt Merchants gain,
to his money adventured.

So the third Merchants gain being 250 pounds, and his adventure 500 pounds, it will be found that the firſt Merchant adventured 700 pounds. For,

As 250 to 500 — 250 Z 500
So are 350 to 700 — 350 Z 700

FELLOWSHIP in *Loſſe.*

THe uſe of this part is, to finde in a juſt proportion what every Merchant or Creditor muſt loſe in caſe any man die indebted to divers, and leave not ſufficient to pay all: Or that Seamen by foul weather, be forced to caſt ſome goods over board, for ſaving their lives, ſhip, and reſt of the goods, or ſuch like. It differs nothing in operation from the wayes before preſcribed in *Fellowſhip in Gain.* For as there the money adventured is the diviſor, and the money gained the dividend. So here the totall of the money owing, or goods laden, aboard a ſhip, is the diviſor, and the deceaſed eſtate, or goods caſt over-board, the dividend (according to the firſt way,) and the quotient is the loſſe in 1 pound. Then,

As 1,
is to the quotient,
So is every mans perticular debt,
to every mans perticular part.
And

As

As 1,
is to the quotient; [aboard,
So is every Merchants perticular goods laden
to every Merchants perticular loſſe.

And (according to the ſecond way) the totall of the money owing, or goods laden aboard the ſhip, is likewiſe the diviſor and firſt number, the totall of the deceaſed eſtate or goods caſt over-board, the ſecond number, and every mans perticular debt owing him, or every mans perticular goods laden aboard, the third number. For,

As the totall of the money owing,
to the totall of the deceaſed eſtate;
So is every mans perticular debt owing,
to every mans perticular part

And,

As the totall of the goods laden aboard,
to the totall of the goods caſt over-board;
So is every Merchants perticular goods,
to every Merchants perticular loſſe.

1 *Having the quotient, or loſs in one pound, and every Merchants perticular goods laden aboard any Ship or Veſſell, to finde every Merchants perticular loſſe.*

As 1, is to the quotient,
So the firſt Merchants goods, to his loſſe.

So the quotient being 416666, and the firſt Mer-

Merchants goods 48 tuns of wine, and 45 tuns in all, being caſt over board, his loſſe will be found to be 20 tuns. For,

As 1 to 4|16666 — 1 — 4|16666
So 48 to 19|999968 — 48 — 19|999968

As 1 is to the quotient,
So the third ſecond Merchants goods to his loſs

So the quotient being 4|16666, and the ſecod Merchants goods, 36 tuns of wine, his loſſe will be found to be 15 tuns. For,

As 1 to 4|16666 — 1 — 4|16666
So 36 to 14|999976 — 36 — 14|999976

As 1, to the quotient;
So the third Merchants goods, to his loſſe.

So the quotint being 4|16666, and the third Merchants goods 24 tuns, his loſſe will be found to be 10 tuns. For,

As 1 to 4|16666 — 1 — 4|16666
So 24 to 9|999984 — 24 — 9|999984

2 *Having the whole quantity of goods laden aboard any ſhip, and every Merchants perticular goods, and likewiſe the totall of the goods caſt over board, to finde every Merchants perticular loſſe.*

AS the goods laden aboard,
to the goods caſt over board

So the first Merchants goods laden aboard, to his losse.

So the goods laden aboard being 108 tuns of wine, the goods cast over board 45 tuns, and the first Merchants goods laden aboard 48 tuns, his losse will be found to be 20 tuns. For

As 108 to 45; 108 — 45
So are 48 to 20 000 000 48 — 20|000000

As the goods laden aboard,
to the goods cast over board;
So the second Merchants goods laden aboard to his goods lost.

So the goods laden aboard being 108 tuns of wine, the goods cast over board 45 tuns, and the second Merchants goods laden aboard 36 tuns, his losse will be found to be 15 tuns. For,

As 108 to 45; 108 — 45
So are 36 to 15 000 000 36 — 15|000000

As the goods laden aboard,
to the goods cast overboard;
So the third Merchants goods laden aboard, to his losse.

So all the goods laden aboard being 108 tuns of wine, the goods cast over board 45 tuns, and the third Merchants goods laden aboard 24 tuns, his losse will be found to be 10 tuns. For,

As 108 to 45; 108 — 45
So are 24 to 10,000,000 24 — 10,000000

3 *Ha-*

3 *Having a debtors whole eſtate, and the whole ſumme of money, and likewiſe every Creditors perticular debt, to finde every Creditors equall part, every one loſing after a proportionall rate.*

AS the whole ſumme owing,
to the debtors whole eſtate;
So the firſt Creditors whole debt,
to his equall part.

So the whole ſumme owing being 2000 pounds, and the debtors whole eſtate 800 pounds, and the firſt Creditors perticular debt 900 pounds, his equall part will be fouud to be 360 pounds. For,

As 2000 to 800, 2000 — 800
So are 900 to 360. 900 — 360

As the whole ſumme owing,
to the debtors whole eſtate;
So the ſecond Creditors whole debt,
to his equall part

So the whole ſumme owing, being 2000 pounds, and the debtors whole eſtate 800 pounds, and the ſecond Creditors debt 700 pounds; his proportionall part will be found to be 280 pounds. For,

As 2000 to 800; 2000 — 800
So are 700 to 280. 700 — 280

As the whole ſumme owing,
to the Debtors whole eſtate;
So the third Creditors whole debt,
to his equall part.

So the whole ſumme owing being 2000 pounds, and the Debtors whole eſtate 800 pounds, and the third Creditors whole dept 400, his proportionall part will be found to be 160 pounds. For,

As 2000 to 800;	2000	800
So are 400 to 160.	400	160

If any deſire to work this example according to the firſt way. Then,

2000 The totall owing, is the diviſor.
800 The debtors whole eſtate, is the divided

0|4 The Quotient.
00 The Remainer.

Theſe are the parts, the manner of operation and proportions are before ſhewed, therefore I leave to practiſe, and the proof is as the former.

FEL-

FELLOWSHIP in *Time.*

THe uſe of this part is to finde every Merchants juſt and equall part when theyadventure either even or un-even ſums for ſeverall times.

It differeth not in operation from the directionsbefore ſet down in any thing ſave in this, that every Merchants money is multiplied by the time it is advẽtured,&the total of theſe products added together, is the diviſor, the money gained the divident as before, and the quotient the gain in one pound (according to the Rule of Practiſe) & the Proportions are,

As 1,
to the quotient or gain in one pound;
So every mans perticular adventure multiplyed as aforeſaid,
to every mans perticular part of the gain.

Ac-

According to the ſecond way; The products of every Merchants perticular adventure, multiplyed as aforeſaid, added together is the diviſor and firſt number; the money gained the ſecond number, and every Merchants perticular adventure multiplyed as aforeſaid, the third number. And the proportions hold thus.

As the whole money adventured multiplyed as aforeſaid,
to the whole money gained;
So is every Merchants perticular adventure, multiplyed as aforeſaid.
to every Merchants part of the money gained.

Theſe proportions will be manifeſt by the Propoſition following.

1 *Having the gain in 1 pound, and every Merchants perticular adventure, together with the time it was adventured, to finde every Merchants perticular part of the gain.*

AS 1, to the gain in one pound:
So the product of the firſt Merchants adventure and time,
to his gain.

So the gain in one pound being 2 ſhillings, 8 pence, 1 farthing, and the firſt Merchants adventure 100 pounds, vvhich multiplyed by 12 the moneths it vvas adventured, the product vvill be 1200; his part vvill be found to be 161 pounds. For,

As

As 1 to 134166 1 Z 134166

So 1200 to 160|999200 1200 160|999200

As 1,

to the quotient, or gain in one pound;

So the product of the second Merchants adventure and time,

to his part of the gain.

So the gain in 1 pound, being 2 shillings, 8 pence, 1 farthing, the second Merchants adventure 140 pounds, which multiplyed by 9 the moneths it was adventured makes 1260, his part will be found to be 169 pounds, 1 shilling. For,

As 1 to 134166 1 Z 134166

So 1260 to 169|049160 1260 169|049160

As 1,

to the quotient, or gain in pound;

So the product of the third Merchants adventure, and time,

to his part.

So the gain in 1 pound being 2 shillings, 8 pence, 1 farthing, the third Merchants adventure 180 pounds which multiplyed by 5 the moneths it was adventured, makes 900, his part will be found to be 120 pounds, 15 shil. For,

As 1 to 134166 1 Z 134166

So 900 to 120|749400 900 120|749400

2 Ha-

2 *Having the whole ſum of money adventured, and every Merchants perticular adventure, and the time they were adventured, to finde every Merchants perticular part of the gain.*

AS the ſeveral adventures multiplyed by their (times
to the whole ſumme gained. (time,
So the firſt Merchants adventure multip. by its
to the firſt Merchants part of the gain.

So the ſeverall adventures multiplyed by their times, being 3360, the whole ſumme gained 450 pounds, 16 ſhillings, and the Merchants adventure 100 pounds, which multiplyed by 12, the moneths it was adventured, makes 1200, his part of the gain will be found to be 161 pounds. For,

As 3360 to 450|8 3360 Z 450 8
So 1200 to 161|00000 1200 Z 161|00000

As the ſeverall adventures, multiplyed by their times;
to the whole ſumme gained:
So the ſecond Merchants adventure, multiplyed by its time,
to the ſecond Merchants part of the gain.

So the totall of their ſeverall adventures, multiplyed by their times being 3360, the whole

whole ſumme gained 450 pounds, 16 ſhillings, and the ſecond Merchants adventure 140 pounds, which multiplyed by 9, the moneths it was adventured, makes 1260, his part of the gain will be found to be 169 pounds, 1 ſhilling. For,

As 3360 to 450|8 3360 Z 450|8
So 1260 to 169|05000 1260 169|05000

As the ſeverall adventures multi plyed by their times,
to the whole ſumme gained;
So the third Merchants adventure multiplyed by its time,
to the third Merchants part of the gain.

So the to tall of the ſeverall adventures multiplyed by their times being 3360, the whole ſumme gained 450 pounds, 16 ſhillings, and the third Merchants adventure 180 pounds, which multiplyed by 5, the moneths it was adventured, makes 900, his part of the gain will be found to be 120 pounds, 15 ſhillings. For,

As 3360 to 450|8 3360 Z 450|8
So 900 to 120|75000 900 120|75000

Æ-

As 250 to 500 — 250 Z 500
So are 400 to 800 — 400 Z 800

As the third Merchants gain,
to his money adventured;
So the firſt Merchants gain,
to his money adventured.

So the third Merchants gain being 250 pounds, and his adventure 500 pounds, it will be found that the firſt Merchant adventured 700 pounds. For,

As 250 to 500 — 250 Z 500
So are 350 to 700 — 350 Z 700

FELLOWSHIP in *Loſſe.*

THe uſe of this part is, to finde in a juſt proportion what every Merchant or Creditor muſt loſe in caſe any man die indebted to divers, and leave not ſufficient to pay all: Or that Seamen by foul weather, be forced to caſt ſome goods over board, for ſaving their lives, ſhip, and reſt of the goods, or ſuch like. It differs nothing in operation from the wayes before preſcribed in *Fellowſhip in Gain.* For as there the money adventured is the diviſor, and the money gained the dividend. So here the totall of the money owing, or goods laden, aboard a ſhip, is the diviſor, and the deceaſed eſtate, or goods caſt over-board, the dividend (according to the firſt way,) and the quotient is the loſſe in 1 pound. Then,

As 1,
is to the quotient,
So is every mans perticular debt,
to every mans perticular part.
And

As

As 1,
is to the quotient; [aboard,
So is every Merchants perticular goods laden
to every Merchants perticular losse.

And (according to the second way) the totall of the money owing, or goods laden aboard the ship, is likewise the divisor and first number, the totall of the deceased estate or goods cast over-board, the second number, and every mans perticular debt owing him, or every mans perticular goods laden aboard, the third number. For,

As the totall of the money owing,
to the totall of the deceased estate;
So is every mans perticular debt owing,
to every mans perticular part

And,

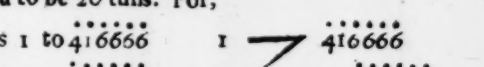
As the totall of the goods laden aboard,
to the totall of the goods cast over-board;
So is every Merchants perticular goods,
to every Merchants perticular losse.

1 *Having the quotient, or loss in one pound, and every Merchants perticular goods laden aboard any Ship or Vessell, to finde every Merchants perticular losse.*

AS 1, is to the quotient,
So the first Merchants goods, to his losse.

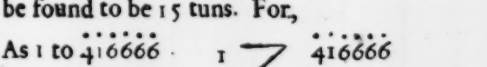
So the quotient being $4\dot{1}6\dot{6}6\dot{6}$, and the first Mer-

Merchants goods 48 tuns of wine, and 45 tuns in all, being caſt over board, his loſſe will be found to be 20 tuns. For,



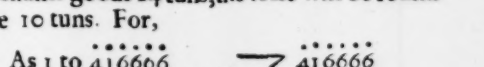
As 1 is to the quotient,
So the third ſecond Merchants, goods to his loſs

So the quotient being 4|16666, and the ſecõd Merchants goods, 36 tuns of wine, his loſſe will be found to be 15 tuns. For,



As 1, to the quotient;
So the third Merchants goods, to his loſſe.

So the quotint being 4|16666, and the third Merchants goods 24 tuns, his loſſe will be found to be 10 tuns. For,



2 *Having the whole quantity of goods laden aboard any ſhip, and every Merchants perticular goods, and likewiſe the totall of the goods caſt over board, to finde every Merchants perticular loſſe.*

AS the goods laden aboard,
to the goods caſt over board

So the firſt Merchants goods laden aboard, to his loſſe.

So the goods laden aboard being 108 tuns of wine, the goods caſt over board 45 tuns, and the firſt Merchants goods laden aboard 48 tuns, his loſſe will be found to be 20 tuns. For

As 108 to 45 ; 108 — 45

So are 48 to 20 ; 48 — 20

As the goods laden aboard,
to the goods caſt over board ;
So the ſecond Merchants goods laden aboard to his goods loſt.

So the goods laden aboard being 108 tuns of wine, the goods caſt over board 45 tuns, and the ſecond Merchants goods laden aboard 36 tuns, his loſſe will be found to be 15 tuns. For,

As 108 to 45 ; 108 — 45

So are 36 to 15 ; 36 — 15

As the goods laden aboard,
to the goods caſt overboard ;
So the third Merchants goods laden aboard, to his loſſe.

So all the goods laden aboard being 108 tuns of wine, the goods caſt over board 45 tuns, and the third Merchants goods laden aboard 24 tuns, his loſſe will be found to be 10 tuns. For,

As 108 to 45 ; 108 — 45

So are 24 to 10 ; 24 — 10

3 *Having a debtors whole eſtate, and the whole ſumme of money, and likewiſe every Creditors perticular debt, to finde every Creditors equall part, every one loſing after a proportionall rate.*

AS the whole ſumme owing,
to the debtors whole eſtate;
So the firſt Creditors whole debt,
to his equall part.

So the whole ſumme owing being 2000 pounds, and the debtors whole eſtate 800 pounds, and the firſt Creditors perticular debt 900 pounds, his equall part will be fouud to be 360 pounds. For,

As 2000 to 800, 2000 Z 800
So are 900 to 360. 900 Z 360

As the whole ſumme owing,
to the debtors whole eſtate;
So the ſecond Creditors whole debt,
to his equall part

So the whole ſumme owing, being 2000 pounds, and the debtors whole eſtate 800 pounds, and the ſecond Creditors debt 700 pounds; his proportionall part will be found to be 280 pounds. For,

As 2000 to 800; 2000 Z 800
So are 700 to 280. 700 Z 280

As the whole ſumme owing,
to the Debtors whole eſtate;
So the third Creditors whole debt,
to his equall part.

So the whole ſumme owing being 2000 pounds, and the Debtors whole eſtate 800 pounds, and the third Creditors whole dept 400, his proportionall part will be found to be 160 pounds. For,

As 2000 to 800;	2000	800
So are 400 to 160.	400	160

If any deſire to work this example according to the firſt way. Then,

2000 The totall owing, is the diviſor.
800 The debtors whole eſtate, is the divided

0|4 The Quotient.
00 The Remainer.

Theſe are the parts, the manner of operation and proportions are before ſhewed, therefore I leave to practiſe, and the proof is as the former.

FEL-

FELLOWSHIP in *Time.*

THe uſe of this part is to finde every Merchants juſt and equall part when theyadventure either even or un-even ſums for ſeverall times.

It differeth not in operation from the directionsbefore ſet down in any thing ſave in this, that every Merchants money is multiplied by the time it is advẽtured,&the total of theſe products added together, is the diviſor, the money gained the divident as before, and the quotient the gain in one pound (according to the Rule of Practiſe) & the Proportions are,

As 1,
to the quotient or gain in one pound;
So every mans perticular adventure multiplyed as aforeſaid,
to every mans perticular part of the gain.

Ac-

According to the ſecond way; The products of every Merchants perticular adventure, multiplyed as aforeſaid, added together is the diviſor and firſt number; the money gained the ſecond number, and every Merchants perticular adventure multiplyed as aforeſaid, the third number. And the proportions hold thus.

As the whole money adventured multiplyed as aforeſaid,
to the whole money gained;
So is every Merchants perticular adventure, multiplyed as aforeſaid.
to every Merchants part of the money gained.

Theſe proportions will be manifeſt by the Propoſition following.

1 *Having the gain in 1 pound, and every Merchants perticular adventure, together with the time it was adventured, to finde every Merchants perticular part of the gain.*

AS 1, to the gain in one pound:
So the product of the firſt Merchants adventure and time,
to his gain.

So the gain in one pound being 2 ſhillings, 8 pence, 1 farthing, and the firſt Merchants adventure 100 pounds, vvhich multiplyed by 12 the moneths it vvas adventured, the product vvill be 1200; his part vvill be found to be 161 pounds. For, As

As 1 to 134166 1 Z 134166

So 1200 to 160999200 1200 160999200

As 1,
to the quotient, or gain in one pound;
So the product of the second Merchants adventure and time,
to his part of the gain.

So the gain in 1 pound, being 2 shillings, 8 pence, 1 farthing, the second Merchants adventure 140 pounds, which multiplyed by 9 the moneths it was adventured makes 1260, his part will be found to be 169 pounds, 1 shilling. For,

As 1 to 134166 1 Z 134166

So 1260 to 169049160 1260 169049160

As 1,
to the quotient, or gain in pound;
So the product of the third Merchants adventure, and time,
to his part.

So the gain in 1 pound being 2 shillings, 8 pence, 1 farthing, the third Merchants adventure 180 pounds which multiplyed by 5 the moneths it was adventured, makes 900, his part will be found to be 120 pounds, 15 shil. For,

As 1 to 134166 1 Z 134166

So 900 to 120749400 900 120749400

2 Ha-

2 *Having the whole ſum of money adventured, and every Merchants perticular adventure, and the time they were adventured, to finde every Merchants perticular part of the gain.*

AS the ſeveral adventures multiplyed by their (times
to the whole ſumme gained. (time,
So the firſt Merchants adventure multip. by its
to the firſt Merchants part of the gain.

So the ſeverall adventures multiplyed by their times, being 3360, the whole ſumme gained 450 pounds, 16 ſhillings, and the Merchants adventure 100 pounds, which multiplyed by 12, the moneths it was adventured, makes 1200, his part of the gain will be found to be 161 pounds. For,

As 3360 to 450 8 3360 Z 450 8
So 1200 to 161 00000 1200 161 00000

As the ſeverall adventures, multiplyed by their times;
to the whole ſumme gained:
So the ſecond Merchants adventure, multiplyed by its time,
to the ſecond Merchants part of the gain.

So the totall of their ſeverall adventures, multiplyed by their times being 3360, the whole

whole ſumme gained 450 pounds, 16 ſhillings, and the ſecond Merchants adventure 140 pounds, which multiplyed by 9, the moneths it was adventured, makes 1260, his part of the gain will be found to be 169 pounds, 1 ſhilling. For,

As 3360 to 450|8 3360 Z 450|8
So 1260 to 169|05000 1260 169|05000

As the ſeverall adventures multi plyed by their times,
to the whole ſumme gained;
So the third Merchants adventure multiplyed by its time,
to the third Merchants part of the gain.

So the totall of the ſeverall adventures multiplyed by their times being 3360, the whole ſumme gained 450 pounds, 16 ſhillings, and the third Merchants adventure 180 pounds, which multiplyed by 5, the moneths it was adventured, makes 900, his part of the gain will be found to be 120 pounds, 15 ſhillings. For,

As 3360 to 450|8 3360 Z 450|8
So 900 to 120|75000 900 120|75000

Æ-

ÆQVATION IN PAYMENTS.

The first Part.

THis Rule may be divided into two parts ; The first may be *Æquation of Payments in time*; The second, *Æquation of Payments present or without time.*

The use of the first part is, when a Merchant hath a summe of money to be paid at severall dayes, to find at what time it ought to be paid at one payment. It is wrought two wayes. First, if any money be to be paid present, and the rest at severall dayes, it is wrought by Multiplication, Addition, and Division: For first, they multiply every payment, (the ready money excepted) by the time thereof, then adde the products together, and the totall is the dividend, the whole summe of money owing the divisor, and the quotient is the answer, and give the time of payment at one entire summe, as in the first example.

If

If there be no money to be paid present, but all at severall payments, then it is wrought by Multiplication and Addition: for first they multiply every payment by the time thereof, then adde all the products together, and the totall gives the time wherein it must be paid at one entire summe, as in the second example.

1 *Example.*

A Merchant hath owing him 655 pounds, to be paid 200 ℔. present, 100 ℔. at 5 moneths, 300 ℔. at 9 moneths, and 55 pounds at 12 moneths. Now multiply 100 by 5, makes 500, then multiply 300 by 9, makes 2700, and 55 multiplyed by 12 makes 650, all which products added together, make 3850, which divided by 655, the whole money owing, the quotient will be 5|$\dot{8}\dot{7}\dot{7}\dot{8}\dot{6}$, which is 5 moneths, and 26 days, and at such time it ought to be paid at one payment.

```
   5 44
  5156|1
 575155|7
 3850|0000|0  (5|87786
 65555555
  655555
   6666
```

2 *Example.*

A Merchant hath owing him 975 pounds, 15 shil-

shillings, to be paid at severall payments, that is to say $\frac{1}{7}$ at 4 moneths, $\frac{1}{8}$ at 6 moneths, $\frac{3}{10}$ at 9 moneths, and $\frac{1}{8}$ at 12 moneths. Now the question is at what time these ought to be paid at one payment? Answer at 8 moneths, 22 dayes and a half.

$\frac{1}{7}$	0	$\dot{8}$
$\frac{1}{8}$	0	$\dot{7}5\dot{0}$
$\frac{3}{10}$	2	$\dot{7}$
$\frac{1}{8}$	4	$5\dot{0}\dot{0}$
Moneths	8	$7\dot{5}\dot{0}$

Set down the fractions in artificiall numbers, as the parts of a pound, as $\frac{1}{7}$, thus $\dot{2}$; $\frac{1}{8}$ thus $1\dot{2}5$, $\frac{3}{10}$ thus $\dot{3}$; and $\frac{1}{8}$ thus $3\dot{7}5$, then multiply every one by the time thereof, as $\dot{2}$, by 4, makes $\dot{8}$ primes; which place on the right hand the prime line; Then multiply $1\dot{2}5$ thirds by 6, the time thereof $7\dot{5}0$, and $\dot{3}$ primes by 9, makes $2\dot{7}$, and lastly $3\dot{7}5$ thirds by 12 the time thereof, makes $4\dot{5}0\dot{0}$, and having placed each denomination under other, adde them altogether, and the totall will be $8\dot{7}5\dot{0}$, which is 8 moneths and $\frac{1}{4}$ of a moneth, or 22 dayes and $\frac{1}{2}$ as before

THE

The ſecond PART.

THe uſe of this ſecond Part, is to find how much every Merchant muſt pay in a juſt and equall proportion, when divers joyn together in buying any goods and merchandize, and likewiſe to find how much every Merchant muſt receive when they have gained any ſumme in joynt adventure.

It is wrought two wayes, as the Rule of Fellowſhip is, and as is there ſhewed, that is both by the Rule of Practiſe, and Rule of Three, whereof, although before I have given ample expreſſions, yet here again it will not be ſuperfluous. Therefore if you work according to the Rule of Practiſe, having found the Quotient, as before is taught. Then,

As 1,
to the Quotient;
So every Merchants adventure,
to every Merchants gain.

And,

As 1,
to the Quotient;
So every Merchants part of the goods,
to every Merchants payment.

Theſe Proportions will be illuſtrated by the examples following.

1 *Example.*

Admit three Merchants A, B, C, buy a parcell of Cloves for 2350 pounds, whereof A muſt pay $\frac{1}{5}$, B $\frac{1}{4}$, and C $\frac{1}{7}$; The queſtion is, how much every Merchant muſt pay?

Set down the fractions in artificiall numbers, as before is directed, and as in the example hereunto annexed appeareth; then adde them together, and the totall is the diviſor, and the money to be paid the dividend

$\frac{1}{5}$	5
$\frac{1}{4}$	25
$\frac{1}{7}$	2
0	95

When you divide by a fraction (as here) remember always to adde a Cypher or more to the dividend, if it be whole numbers onely) to turn it into the ſame denomination that the firſt figure in the diviſor is of, according to the 17th. Rule.

95	*Diviſor.*
23500,0000	*Dividend.*
2473,6842	*Quotient.*
5	*Remainer.*

Now,

As 1,
to the Quotient;
So the firſt Merchants part of the Cloves,
to his payment.

So

So the Quotient being 2473|68421, and the first Merchants part of the Cloves $\frac{1}{2}$, his part of the payment wil be found to be 1236 pounds 16 shillings, 10 pence, 1 farthing. For,

As 1 to 2473|68421; 1 Z 2473|68421
So 5 to 1236|842105 5 1236|842105

As 1, to the quotient;
So the second Merchants part, to his payment.

So the Quotient being 2473|68421, and the second Merchants part $\frac{1}{4}$; his part of the payment will be found to be 618 pounds, 8 shillings, 5 pence, 1 farthing. For,

As 1 to 2473|68421; 1 Z 2473|68421
So 25 to 618|4210525 25 618|4210525

As 1, to the quotient;
So the third Merchants part, to his payment.

So the Quotient being 2473|68421, and the third Merchants part $\frac{1}{5}$; his part of the payment will be found to be 494 pounds, 14 shillings, 8 pence, 3 farthings. For,

As 1 to 2473|68421 1 Z 2473|68421
So 2 to 494|736842 2 494|736842

The

1236	842105
618	4210525
494	736842
	5 *Remain.*
2350	0000000 *Proof.*

The proof of this and all other the following examples are to add all the payments, and the remainer of the diviſion (if any be) together, and if the totall produce the money to be paid, it is right, elſe not.

Now we will work this queſtion according to the Rule of Three, which is the ſecond way, where all the Merchants parts of the payments, found by diviſion, and added together is the diviſor and firſt number, the ſumme gained, or to be paid the ſecond number, and every Merchants part of the payment found by diviſion, as hereafter is ſhewed the third number; and the fourth number is the juſt proportion that every one muſt pay or receive. And the proportions hold thus;

As the totall of the Merchants parts found by diviſion,
to the whole ſumme to be received or paid;
So every Merchants part found as aforeſaid,
to every Merchants part, to receive or pay.

To

To finde the diviſor in this way, take the $\frac{1}{2}$, the $\frac{1}{4}$, the $\frac{1}{5}$ of 2350, that is divide 2350 by 2, 4, and 5, the totall of which quotients added together, is the diviſor and firſt number, the ſumme to be paid, namely 2350, the ſecond number, and every Merchants perticular part found as above, the third number, as is before declared.

$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$ of 2350 is 1175, 587|5, 470

Diviſor. 2232|5

Now if you ſubſtract 2232|5 from 2350 you ſhall finde that the parts above found fall 117 pounds, 10 ſhillings, ſhort of the ſumme to be paid: Therefore to finde in a juſt proportion what every one is to pay ſerves this Golden Rule.

As the totall of the Merchants parts,
to the whole ſumme to be paid,
So is the firſt Merchants part,
to his payment.

So the totall of the Merchants parts found as above, being 2232 pounds, 10 ſhillings, and the firſt Merchants part 1175 pounds, and the whole ſumme to be paid 2350 pounds, his payment will be found to be 1236 pounds, 16 ſhillings, 10 pence, 1 farthing. For,

As 2232|5 to 2350 2232|5 Z 2350
So 1175 to 1236|84210 1175 1236|84210

As the totall of the Merchants parts,
to the whole ſumme to be paid;
So the ſecond Merchants part,
to his payment.

So the totall of the Merchants parts being 2232 *lb*. 10 ſhil the whole ſum to be paid 2350 *lb*. and the ſecond Merchants part found as afore 587 *lb*. 10 ſhil. his payment will be found to be 618 pounds, 8 ſhil 5 pence, 1 farthing. For

As 2232|5 to 2350; 2232|5 Z 2350
So 587|5 to 618|42100 587|5 618|42106

As the totall of the Merchants parts,
to the whole ſum to be paid;
So the third Merchants part.
to his payment.

So the totall of the Merchants parts being 2232 *lb*. 10 ſhill. the whole ſum to be paid 2350 *lb*. and the third Merchants part found as afore 470 *lb*. his payments will be found to be 494 pounds, 14 ſhillings, 8 pence, 3 farthings. For,

As 2232|5 to 2350; 2232|5 Z 2350
So 470 to 494|73684 470 494|73684

2 *Example.*

Admit three Merchants A, B, C, upon a joynt

joynt adventure gain 120 pounds; whereof A is to have $\frac{1}{2}$, B $\frac{1}{3}$, and C $\frac{1}{4}$, I demand how much each man muſt have.

1	083333	*Diviſor which is found, as before.*
120	000000	*Dividend.*
110	769264	*Quotient.*
	1713	*Remainer.*

As 1 to the quotient;
So the firſt Merchants part, to his gain.

So the quotient being 110|769264, and his part $\frac{1}{2}$, his juſt gain will be found to be 55 *lb.* 7 ſhillings, 8 pence, 1 farthing. For,

As 1 to 110|769264 — 1 Z 110|769264
So 5 to 551|846320 — 5 Z 551|384630
As 1 to the quotient;
So the ſecond Merchants part, to his gain.

So the quotient being 110|769264, and the ſecond Merchants part $\frac{1}{3}$, his gain will be found to be 36 *lb.* 18 ſhil., 5 pence, 3 farthings. For,

As 1 to 110|769264 — 1 Z 110|769264
So 333333 to 36923050 — 333333 Z 36923050
As 1, to the quotient;
So the third Merchants part, to his gain.

So the Quotient being 110|769264, and the third Merchants part $\frac{1}{4}$, his part of the gain will be found to be 27 pounds, 13 ſhillings, 10 pence, 1 farthing. For,

As 1 to 110769264;	1	Z	110|769264
So 25 to 27.6922600	25		27|6922600

$\left.\begin{matrix}\frac{1}{2}\\ \frac{1}{3}\\ \frac{1}{4}\end{matrix}\right\}$ of 120 pounds is $\left\{\begin{matrix}60\\40\\30\end{matrix}\right.$

Diviſor. 130

We will work this queſtion again the 2d way, wherein every Merchants part. and the diviſor being found by diviſion, are as here annexed appeareth.

And here note that in the former example, the parts added together came 117 pounds, 10 ſhillings, ſhort of the ſumme to be paid, but in this they exceed the ſumme to be received by 10 pounds.

Therefore to finde the juſt ſumme that every Merchant is to receive, work thus,

As the totall of the Merchants parts,
to the whole ſumme to be received;
So the firſt Merchants part,
to the ſumme he is to receive.

So the totall of the Merchants parts being 130 pounds, the whole ſumme to be received 120 ℔. and the firſt Merchants part, according to diviſion 60 pounds, his part of the gain will be found

found to be but 55 pounds, 7 ſhillings, 8 pence, 1 farthing. For,

As 130 to 120; 130 — 120

So 60 to 55|384615 60 — 55|384615

As the totall of the Merchants parts,
to the whole ſumme to be received;
So the ſecond Merchants part,
to the ſumme he is to receive.

So the totall of the Merchants parts being 130 pounds, the whole ſumme to be received 120 pounds, and the ſecond Merchants part, according to diviſion 40 pounds, his proportionall part will be found to be but 36 pounds, 18 ſhillings, 5 pence, 3 farthings. For,

As 130, to 120; 130 — 120

So 40 to 36|923076 40 — 36|923076

As the totall of the Merchants part,
to the whole ſumme to be received;
So the third Merchants part,
to the ſumme he is to receive.

So the totall of the Merchants parts being 130 pounds, the whole ſumme to be received 120 pounds, and the third Merchants part, according to diviſion 30 pounds, his proportionall part will be found to be but 27 pounds, 13 ſhillings, 10 pence, 1 farthing. For,

At 130 to 120; 130 — 120

So are 30 to 27|692307 30 — 27|692307

3 Example.

Four men have 300 ſheep, whereof the firſt hath 100, the ſecond 40, the third 150, and and the fourth 10. They give unto a ſhepheard to keep theſe ſheep 25 pounds wages a year, meat and drinke: The queſtion is what part of the wages every man muſt pay, and how many dayes every man muſt dyet him?

As the whole number of ſheep,
to the firſt mans perticular number;
So the whole years wages,
to the firſt mans perticular part.

So the whole number of ſheep being 300, the firſt mans 100, and the whole years wages 25 pounds, the part of the wages the firſt man is to pay will be found to be 8 pounds, 6 ſhillings 8 pence. For,

As 300 to 100 — 300 — 100
So are 25 to 8|333 — 25 — 8|333

As the whole number of ſheep,
to the ſecond mans perticular number,
So the whole years wages,
to the ſecond mans part thereof.

So the whole number of ſheep being 300, the ſecond mans 40, and the whole years wages 25 pounds, the ſecond mans part thereof will be found to be 3*lb*. 6 ſhil. 8 pence. For,

As 300 to 40; — 300 — 40
So are 25 to 3|333 — 25 — 3|333

As

As the whole number of ſheep,
to the third mans number;
So the whole years wages,
to the third mans part thereof.

So the whole number of ſheep being 300, the third mans 150, and the whole years wages twenty five pounds, the third mans part there-will be found to be 12 pounds, 10 ſhillings. For,

As 300 to 150; 300 — 150
So are 25 to 12|5 25 — 12|5

As the whole number of ſheep,
to the fourth mans number;
So the whole years wages,
to the fourth mans part thereof.

So the whole number of ſheep being 300, the fourth mans 10, and the whole years wages 25 pounds, the fourth mans part to pay will be found to be 16 ſhillings, 8 pence. For,

As 300 to 10, 300 — 10
So are 25 to 0|8̇3̇ 25 — 0|8̇3̇

And to find how many dayes every man muſt dyet him, work thus;

As the whole number of ſheep,
to the firſt mans number;
So the dayes in one year,
to the days the firſt man muſt keep him.

So

So the whole number of ſheep being 300, the firſt mans 100, and the dayes in one year 365, it will be found that the firſt man muſt keep the Shepheard 121 days, and 20 hours. For,

As 300 to 100 ; 300 Z 100

So are 365 to 121|$\dot{6}\dot{6}\dot{6}$ 365 Z 121|$\dot{6}\dot{6}\dot{6}$

As the whole number of ſheep,
to the ſecond mans number ;
So the dayes in one year,
to the dayes the ſecond man muſt keep him.

So the whole number of ſheep being 300, the ſecond mans 40, and the dayes in one year 365, it will be found that the ſecond man muſt keep the ſhepheard 48 dayes, and 20 hours. For,

As 300 to 40 ; 300 Z 40

So are 365 to 48|$\dot{6}\dot{6}\dot{6}$ 365 Z 48|$\dot{6}\dot{6}\dot{6}$

As the whole number of ſheep,
to the third mans number ;
So the days in one year,
to the dayes the third man muſt keep him

So the whole number of ſheep being 300, the third mans 150, and the dayes in one year 365, it will be found that the third man muſt keep the Shepheard 182 days and $\frac{1}{2}$. For,

As 300 to 150 300 Z 150

So are 365 to 182|5 365 Z 182|5

As

As the whole number of ſheep,
to the fourth mans number,
So the dayes in one year,
to the days the fourth man muſt keep him

So the whole number of ſheep being 300, the fourth mans 10, and the dayes in one year 365, it will be found that the fourth man muſt keep the Shepheard 12 days, and 20 hours. For,

As 300 to 10; 300 Z 10
So are 365 to $12\dot{6}\dot{6}\dot{6}$ 365 1 $12|\dot{6}\dot{6}\dot{6}$

4 *Example.*

A man being ſick made his Will and dyed, leaving his Wife great with child, and in his Will ordained that if ſhe had a daughter, ſhe ſhould have $\frac{2}{3}$ of his eſtate, which was 1200 pounds, and the daughter $\frac{1}{3}$: but if ſhe had a ſonne, that then he ſhould have $\frac{2}{3}$, of his eſtate, and the mother $\frac{1}{3}$. And it happened that ſhe was delivered both of a ſonne and a daughter, at one birth: The queſtion is what part of the eſtate each of them muſt have, that the Teſtators mind and will may be fulfilled?

You may perceive that the Teſtators minde and wil was, that the mother ſhould have twice as much as the daughter, and the ſon twice as much as the mother; ſo that if the daughter, had 1 ſhilling, the mother ſhould have 2 ſhillings, and the ſonne 4 ſhillings, therefore add

thoſe

thoſe 3 numbers together, make 7, by which divide 1200 pounds, the whole eſtate, then multiply the quotient by every one of thoſe numbers, that is by 1, 2, 4 ſeverally, and the ſeverall products will give every ones part, according to the Rule of Practiſe.

1200 *The whole Eſtate and Dividend.*
7 *The totall of the Addition & Diviſor*

171|428 *The Quotient.*
7 *The Remainer.*

As 1 to the Quotient;
So 2 to the mothers part.

So the Quotient being 171|428, the mothers part will be found to be 342 pounds 17 ſhil. 1 penny, 2 farthings. For,

As 1 to 171|428; 1 Z 171|428
So is 2 to 342|856 2 342|856

As 1 to the quotient,
So 4 to the ſonnes part.

So the qnotient being 171|428, the ſonnes part will be found to be 685 pounds, 14 ſhillings, 3 pence. For,

As 1 to 171|428 1 Z 171|428
So is 4 to 685|712 4 685|712

As 1 to the quotient;
So 1 to to the daughters part. So

So the quotient being 171|428, the daughters part will be found to be 171 pounds, 8 ſhillings 6 pence 3 farthings. For,

As 1 to 171|428 1 Z 171|428
So is 1 to 171|428. 1 Z 171|428

5 *Example.*

Three Merchants bought 1000 pounds, weight of Sinamon for 300 pounds; whereof the firſt had 200 pounds weight, the ſecond 350, and the third 450. I demand what part of the 300 pounds every man muſt pay?

As the whole quantity of Sinamon,
to the price thereof;
So the quantity the firſt Merchant had,
to the price thereof.

So the whole quantity of Sinamon, being 1000 pounds weight, the price thereof 300 pounds, and the quantity the firſt Merchant had 200 pounds weight, the ſumme he is to pay will be found to be 60 pounds. For,

As 1000 to 300 1000 Z 300
So are 200 to 60 200 Z 60

As the whole quantity of Sinamon,
to the price thereof;
So the quantity the ſecond Merchant had,
to the price thereof,

So

So the whole quantity of Sinamon being 1000 pounds weight, the price thereof 300 pounds, and the quantity the fecond Merchant had 350 pound weight, the fumme he is to pay will be found to be 105 pounds. For,

As 1000 to 300, 1000 / 300
So are 350 to 105. 350 \ 105

As the whole quantity of Sinamon,
to the price thereof;
So the quantity the third Merchant had,
to the price thereof.

So the whole quantity of Sinamon being 1000 pounds weight, the price thereof 300 pounds, and the quantity the third Merchant had 450 pound weight, the fumme he is to pay will be found to be 135 pounds. For,

As 1000 to 300; 1000 / 300
So are 450 to 135. 450 \ 135

TARE

TARE.

When a Merchant ſels Sugar, Currants, or ſuch like Merchandize that is ſold by weight to a Grocer, or other Chapman he allows certain pounds in the hundred weight, as 14, 15, 15½, or 16, as they can agree,, for Tare, that is for the weight of the Cheſt, or Cask wherein the Sugar or Currants ſo weighed is, and the Sugar or Currants ſo weighed, is called the groſſe weight thereof, the Tare being ſubſtracted, the remainer is the neat weight. And to finde the Tare, ſerves this Rule.

Example.

Let it be granted that a Grocer hath bought 4 Carateels of Currants, at 35 ſhillings the hundred weight. The groſſe whereof is 32 hundred ½, and 8 pounds weight, with allowance for Tare, after 16 pounds to the hundred, and he deſires to know the Neat weight thereof and the price of the Neat.

	C.	q	p.
	8	2	16
	7	3	10
	9	2	2
	6	2	8
	32	2	8

There

Groſſe. 32'5714285
Allowance. 16

1954285710
325714285

521|1428560

There are divers operations in this Rule. Firſt, having added the Groſſe weight together, they multiply it by the allowance for Tare, and the product is the Tare in Pounds.

53 21
739 6434|6

521|1428560(4|653c612
xxxxxxxxx
xxxxxxxx
xxxxxxxx

Secondly, they divide that product by 112, to turn the pounds into hundreds, & thequotient is the Tare in hundreds and parts.

6530612
112

13061224
6530612
6530612

73|1428544

Thirdly, to finde the content of the Fraction, (if there be any) they multiply it by 112, and the product gives on the left hand the prime line the ponnds therein conteined, and on the right hand the parts of a pound.

	C.	q	p.
Groſſe	32	2	8
Tare.	4	2	17
Neat.	27	3	19

Fourthly, to know the Neat weight, they ſubſtract the Tare from the Groſſe, and the remainer is the Neat.

Laſtly,

Laſtly, to know the price of the Neat, they follow the Rule of Practiſe. For,

As 1 to the price of 1 hundred weight,
So the totall of the Neat, to the price thereof.

So the price of 1 hundred weight, being 1 pounds, 15 ſhillings, the price of 27 hundred ¾, and 19 pounds weight will be found to be 48 pounds, 17 ſhillings, 4 pence, 3 farthings. For,

As 1 to 1|75 — 1 Z 1|75
So 27|91964 to 48|86937 — 27|91964 — 48|86937

GAIN

GAIN *and* LOSSE.

THis Rule you ſee conſiſts of two Parts: namely of *Gain* and *Loſſe*, we will firſt treat of *Gain*, then of *Loſſe*.

GAINE.

THe uſe of the Rule of *Gain* is, to find what a Tradeſman gets in the 100 pounds, when he buys at a low price, and ſels at a high: alſo to know at what price he muſt ſell to gaine any rate he deſires in the 100. It is wrought altogether by the Rule of Three, wherein if your firſt number be 100, then the quotient is the gain, which added to the price the goods were bought, gives the price they muſt be ſold at to gain the deſired rate in the 100: but if 100 be in the ſecond or third place, ſubſtract 100 from the quotient, and the remainer is the gain he makes in the 100.

1 *Having the ſumme that any Merchant or Tradeſman deſires to gain in the 100 pounds, and the price the Merchandize coſt, to find at what price they muſt be ſold, to make that gain.*

AS 100 pounds is to the gain in 100 pounds;
So the price the wares coſt, to a 4th number.

Which

Which fourth number added to the price they coſt, gives the price they muſt be ſold at to gain the deſired ſumme in the 100 pounds.

So if a Grocer buy Currants at 1 pound, 15 ſhillings the hundred weight, and would gain after 12 pounds in the 100, he muſt ſell them at 1 pound, 19 ſhillings, 2 pence, 2 farthings, the hundred weight. For,

As 100 to 12; 100 ∠ 12
So are 1|75 to 2100. 1,75 2100

Here add the fourth number 2100 to 1|75 and it makes 1|9600, in coyn 1 pound, 9 ſhillings, 2 pence, 2 farthings, and ſuch is the price he muſt ſell 1 hundred weight at, to gain after the rate of 12 pounds in the 100, as before.

But to avoid the trouble of Addition, and to finde it at one operation, work thus;

As 100, is to 100 and the gain;
So the price they coſt, to the price they muſt be ſold at.

So if the gain deſired be 12 pounds in the hundred, and 1 hundred weight of Currants, coſt 1 pound, 15 ſhillings, they muſt be ſold at 1 pound, 19 ſhillings, 2 pence, 2 farthings, to gain after the rate aforeſaid.

As 100 to 112 — 100 — 112

So are 1|75 to 1|9600 — 1|75 — 1|9600

So alſo if a Tradeſman buy Currants at 4 pence, 2 farthings the pound, he muſt ſell them again, at 5 pence the pound, to gain after 10 pounds in the 100. For,

As 100 to 110; — 100 — 110

So 01875 to 02062 50 — 01875 — 02062 50

And ſo alſo if a Tradeſman buy Sugar at 10 pence the pound weight, he muſt ſell it at 11 pence 2 farthings to gain after 15 pounds in the 100. For,

As 100 to 115; — 100 — 115

So 041664 to 0479360 — 041664 — 479360

2 *Having the price any wares or Merchandize coſt, and the price they are ſold at, to finde what profit or gain they make in the 100 pounds.*

As the price the wares coſt,
to the price they are ſold at;
So is 100 pounds,
to 100 pounds and the gain.

So if a Mercer buy Sayes at 4 pounds, 5 ſhillings, 6 pence the piece, and ſell them again at 4 pounds, 17 ſhillings, 3 pence, he will gain 12 pounds, 12 ſhillings, 10 pence, 1 farthing in the 100. For,

As

As 4¦275 to 4¦8625 4¦275 Z 4¦8625

So 100 to 112¦742690 100 Z 112¦742690

So alſo if a Mercer buy Tabbe at 14 ſhilling the yard, and ſell the ſame again at 17 ſhillings the yard, he will gain after the rate of 21 pounds, 8 ſhillings, 6 pence, 3 farthings in the 100 pounds.

As 7 to 85 7 Z 85

So 100 to 121¦428571 100 Z 121¦428571

And ſo alſo if a Haberdaſher buy Ribbon at 5 pence the yard, and ſell the ſame at 6 pence he will gain after the rate of 20 pounds 1 farthing in the 100 pounds. For,

As 020833 to 025 020833 Z 025

So 100 to 120¦001920 100 Z 120¦001920

In theſe three laſt examples, if you ſubſtract 100 from the fourth numbers, the remainers will be the profit made or gained in the 100 pounds.

3 *Having the price that any Merchandize was ſold at, and the gain made upon the pound, to find what that Merchandize coſt.*

FRom the price that one piece of Kerſey was ſold at, ſubſtract the gain, and the remainer s the price it coſt: Then,

As 1 to the price one Kersey cost;
So the Kerseys sold, to the price thereof.

So if 1 Kersey cost 6 pounds, it will be found that 11 Kerseys cost 66 pounds. For,

As 1 to 6; 1 Z 6
So are 11 to 66. 11 Z 66

In like manner, you may worke any other question, wherein is no time: But if any time of payment be given, then the price it cost will be found at two operations according to the Rule of Three. And the proportions hold thus.

As 12 moneths,
to the gain of 100 pounds in that time;
So are 4 moneths, or any other time,
to a fourth number.

Which fourth number is the proportionable gain in the 100 in that time.

So if 100 pounds in 12 moneths gain 16 pounds, 12 shillings, 6 pence, the proportionable gain for 4 moneths, and 17 dayes, will be found to be 6 pounds, 6 shillings, 6 pence, 1 farthing. For,

As 12 to 16,625 12 Z 16,625
So 4,5666 to 6,32604,37 4,5666 Z 6,32604,37

And having added this proportionall gain for 4 moneths, 17 dayes, to 100, it makes 106,32604,37. Then,

As

As 106|3266437 to 100 ;
So the price the yard was ſold at, to the price it coſt.

So if in one yard of broad Cloth, ſold at 14 ſhillings, 7 pence payable at 4 moneths, 17 dayes, there was gained after the rate of 16 pounds, 12 ſhillings, 6 pence in the 100 pounds for 12 moneths, it will be found that that yard of cloth coſt the ſeller 13 ſhillings, 8 pence, 2 farthings. For,

As 106|3266 to 100 106|3266 Z 100
So 729166 to 068577 729166 Z 068577

Note, that the proportions for this and ſuch like are,

As 100 pounds, and the gain,
to 100 pounds ;
So the price the wares were ſold at,
to the price they coſt.

LOSSE.

THe uſe of this Rule, is to finde what a Tradeſman loſeth in the 100 pounds, when he buys at a high price, and ſels at a lower, it is wrought as gaine is, and therefore I mention not the manner of operation.

1 *Having the price that any wares or Merchandize coſt, and the price they were ſold at, to find what loſs in the 100 pounds.*

As the price the wares coſt,
to the price they are ſold at;
So is 100 pound,
to a fourth number.

Which fourth number being ſubſtracted from 100, the remainer is the loſſe in 100 ℔.

So if a Mercer buy Turkie Grograins at 2 pounds 5 ſhillings the piece, and ſell the ſame again at 2 pounds, 1 ſhilling, 3 pence the piece, it will be found that he loſeth after the rate of 8 pounds, 6 ſhillings, 8 pence in the 100 For,

As 2|25 to 2|0625 — 2|25 — 2|0625
So 00 to 91|6666 — 100 — 91|6666

So

So also if a Woollen-draper bought broad-cloth at 14 shillings, 3 pence the yard, and sold the same again for 13 shillings, 10 pence, it will be found that he loseth after the rate of 2 pounds, 18 shillings, 6 pence, in the 100 pounds. For,

As 7125 to 691666 7 25 Z 691666

So 100 to 9707592 9 100 Z 9707502 9

And so also if a Linnen-draper bought Holland cloth at 2 shillings, 4 pence the ell, and sold it again at 2 shillings, 2 pence, it will be found that he loseth after the rate of 7 *l.* 2 shil. 10 pence, 1 farthing in the 100. For,

As 116666 to 108333 116666 Z 108333

So 100 to 9285747 3 100 Z 9285747 3

2 *Having the price that any goods or wares were sold at, and the losse in one pound, to finde what those goods cost.*

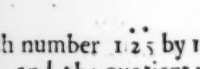
YOu may remember that in the third example in *Gaine*, we substracted the gain in 1 pound out of the money that one piece of Kersey was sold at, and multiplyed the remainer by the number of Kerseys sold, and the product gave the price they cost. But here we substract the losse in 1 pound from 1 pound, and by the remainer, work to finde a fourth number thus,

As

As the remainer,
to 1 pound,
So the price the goods were sold at,
to a fourth number.

So if two els and a half of Holland cloth be sold at 1 pound, 2 shillings, 6 pence, whereupon is lost after the rate of two shillings in the pound, which being substracted from 1 pound rests 18 shillings, or $\dot{9}$ primes, the fourth number will be found to be $1|\dot{2}\dot{5}$. For,

As $\dot{9}$ to $\dot{1}$;
So are $1|\dot{1}\dot{2}\dot{5}$ to $1|\dot{2}\dot{5}$



Now divide this fourth number $1.\dot{2}\dot{5}$ by 1 els the els of Holland sold, and the quotient will be $0|\dot{1}\dot{1}9\dot{0}\dot{4}\dot{7}$, in coyne 2 shillings, 4 pence, 3 farthings; and so much did every ell of Holland cost.

We have left the Division to practise.

BAR-

BARTER.

BArter is the moſt ſubtile and wary manner of dealing that is among Merchants, it therefore behoveth them that deale this way, to have a ſound judgment, a ſharp and ready wit, and good intelligence; a ſound judgment to diſcern the goodneſs of the Merchandize, and the price; a ſharp and ready wit to find the value thereof, and to compare it with his own; and good intelligence how the Merchandize hee barters for will vent either abroad, or at home, or whether it be a drug, or otherwiſe, when hee thinks that hee hath made either a good or a ſaving match, hee may be a great loſer, if hee loſe not both his commodity he gave in Barter, and money to boot.

The uſe of this Rule may be, that the Merchant knowing what the commodity he barters for is worth in ready money, and what he muſt have it for in Barter, to ſet a price upon his own goods anſwerable thereto, that he be not overtaken; alſo to finde who hath the advantage in Bartering, and what he gaineth or loſeth in the hundred.

1 *Ha-*

1 *Having the preſent worth of any goods or wares, and the price thereof in Barter, and the price of any other goods in ready money, to ſet a price upon the ſecond ſort of goods anſwerable to the gain of the firſt*

AS the price of the firſt ſort of goods,
to the price he will have for it in Barter.
So the price of the ſecond ſort of goods,
to the price he muſt rate it at.

So if one pound of wool be worth 1 ſhilling, 3 pence in ready money, and in Barter be rated at 1 ſhilling 9 pence, it will be found that one pound of Indico, worth 4 ſhillings, 6 pence ready money, muſt be rated at 6 ſhillings, 2 pence, 3 farthings to equall the gain of the pound of wool. For.

As	0625	to	0875	0625	0875
So are	225	to	3118	225	3118

2 *Having the price that any goods or wares are worth in ready money, and the price thereof in Barter, to finde who hath the advantage in bartering, and at what rate in the 100.*

AS the price the goods are worth,
to the price thereof in Barter;
So is 100 pounds,
to the gain thereof.

So

So if one Merchant have 9 bolts of Holland cloth at 28 pounds, 8 ſhillings ready money, but in Barter 30 pounds 5 ſhillings: and another have 76 pounds weight of Mace at 22 pounds, 8 ſhillings preſent money, but in barter 25 pounds, 15 ſhillings. It will be found that the ſecond Merchant hath the advantage in Bartering, for he gains after 14 pounds, 10 ſhillings, 2 pence, 2 farthing in the 100 pound, whereas the firſt gains but after 6 pounds, 10 ſhillings, 3 pence, 2 farthings, as in the work appeareth. For,

As 28|4 to the gain thereof 1|85

So is 100 to the gain thereof 6|5140

28|4 Z 1|85
100 Z 6|5140 And

As 22|4 to the gain thereof 3|25

So is 100 to the gain thereof 14|5c98

22|4 Z 3|25
100 Z 14|5c98

Then from 14|5098
Subſtract 6|5140

Reſts 7|9958. And after this rate in the 100 hath the ſecond Merchant gained more than the firſt.

3 *Having the price of a pound of Cloves, and the length of a broad Cloth, and the price of one yard thereof, to find the price of the Cloth, and how many pounds weight of Cloves hee must have for it.*

First, for the price of the Cloth.

As 1 to the price of 1 yard;
So 26 yards to the price thereof.

So if one piece of broad Cloth be 26 yards long, and the price of one yard be 13 shillings 4 pence, the price of the Cloth wil be found to be 17 pounds, 6 shillings 8 pence. For,

As 1 to $\dot{6}\dot{6}\dot{6}\dot{6}\dot{6}\dot{6}$;
So are 26 to $17|\dot{3}\dot{3}\dot{3}\dot{3}\dot{1}\dot{6}$

$$\begin{array}{ccc} 1 & & \dot{6}\dot{6}\dot{6}\dot{6}\dot{6}\dot{6} \\ & Z & \\ 26 & & 17|\dot{3}\dot{3}\dot{3}\dot{3}\dot{1}\dot{6} \end{array}$$

Then the price of 1 pound of Cloves being 8 shillings, divide $17|\dot{3}\dot{3}\dot{3}\dot{3}\dot{1}\dot{6}$ the price of the Cloth by 4 primes the price of one pound of Cloves, and the quotient will be $43|\dot{3}\dot{3}\dot{3}\dot{2}\dot{9}$, which is 43 pounds & $\frac{1}{3}$ of a pound of Cloves, and so many must he have for his Cloth.

$$\begin{array}{l} 1111112|0 \\ 173|333316(43|\dot{3}\dot{3}\dot{3}\dot{2}\dot{9} \\ 4444444 \end{array}$$

AL-

ALLIGATION.

THe rule of *Alligation* is the art to mix or mingle goods of ſeverall prizes and goodneſs tógether, in ſuch an equall proportion, that when they are ſo mixed they may be worth ſuch a price as is deſired.

The manner of operation is thus; Firſt, they ſet down the ſeverall prizes of the goods or Merchandize one under another, the greateſt price in the firſt place, and the leaſt in the laſt, or contrarily. Then they take the difference betwixt the price of every ſort of the goods, and the Price they deſire to ſell it at, or make it worth being ſo mingled, and put the difference of the greateſt price over againſt the leaſt, and the leaſt over againſt the greateſt: and the totall of thoſe differences added together, is the firſt number in the Rule of Three, the quantity to be mingled the ſecond number, and every ſeverall difference the third number.

Example.

A Merchant hath 4 ſorts of Tobacco, the firſt ſort is at 12 ſhillings the pound weight, the ſecond at 9 ſhillings, the third at 5 ſhil. and the

the fourth at 3 ſhillings the pound weight. Of theſe he would mingle 200 pound weight to be worth 8 ſhillings the pound. The queſtion is how much hee muſt take of every ſort in a juſt and equall proportion?

			℔.	
200 ℔ worth 8s.	13	5	71	$\dot{4}\dot{2}\dot{8}\dot{5}$ ſo much of the firſt ſort.
	9	3	42	$\dot{8}\dot{5}\dot{7}\dot{1}$ ſo much of the ſecond.
	5	1	14	$\dot{2}\dot{8}\dot{5}\dot{7}$ ſo much of the third. And
	3	5	71	$\dot{4}\dot{2}\dot{8}\dot{5}$ ſo much of the fourthſort

Diviſor-14 and totall of the differences.

As the totall of the differences of the prices,
to the totall to be compounded;
So the difference of the price oppoſite to the firſt ſort,
to the quantity to be taken of that ſort.

So the totall of the difference of the prices being 14, the totall to be compounded 200 pound weight, and the difference of the price oppoſite to the firſt ſort 5, it wil be found that there muſt be taken of that ſort of Tobacco 71 pound weight, and 7 ounces almoſt. For,

As 14 to 200; 14 — 200
So is 5 to 71|$\dot{4}\dot{2}\dot{8}\dot{5}$ 5 — 71|$\dot{4}\dot{2}\dot{8}\dot{5}$

As

As the totall of the differences of the prices,
to the totall to be compounded;
So the difference of the price oppoſite to the
ſecond ſort,
to the quantity to be taken of that ſort.

So the totall of the difference of the prices being 14, the totall to be compounded 200, and the difference of the price oppoſite to the ſecond ſort 2, it will be found that there muſt be taken of that ſort 42 pounds, 13 ounces & $\frac{1}{7}$. For,

As 14 to 200 14 Z 200
So is 3 to 42|8571 3 Z 42|8571

As the totall of the differences of the prices,
to the totall to be compounded;
So the difference of the price oppoſite to the
third ſort,
to the quantity to be taken of that ſort.

So the totall of the differences of the prices being 14, the totall to be compounded 200, and the difference of the price oppoſite to the third ſort 1, it will be found that there muſt be taken of that ſort 14 pounds, 4 ounces, and $\frac{1}{7}$ for,

As 14 to 200 14 Z 200
So is 1 to 14|2857 1 Z 14|2857

As the totall of the differences of the prices,
to the totall to be compounded;
So the difference of the price oppoſite to the
fourth ſort,
to the quantity to be taken of that ſort, So

So the totall of the differences of the prices being 14, the totall to be compounded 200, and the difference of the price oppoſite to the fourth ſort 5, it will be found that there muſt be taken of that ſort 71 pound, and 7 ounces almoſt. For,

As 14 to 200 — 14 Z 200
So is 5 to 71|4285 — 5 — 71|4285

EX-

EXCHANGE.

THe uſe of the Rule of *Exchange*, is to find what any man ſhall receive when he delivers money in *Flanders*, *France*, or any other forreign Nation, at the rate of thoſe Countreys to be repaid in *England*, and contrarily it is wrought altogether by the Rule of Three.

1 *Having the ſumme of money delivered in* Flanders, *and the rate it is delivered at, and the rate at which it is to be paid, to find how much he is to receive.*

AS 1 pound *Flemiſh*, is to 1,
So the money delivered, to the money to be received.

So if a Merchant deliver in *Flanders*, 500 pounds *Flemiſh* at 19 ſhillings, 6 pence the *Flemiſh* pound, to receive here in *England* 1 pound ſterling for every pound *Flemiſh*, he muſt receive 512 pounds, 16 ſhillings, 5 pence ſterling for his 500 pounds *Flemiſh*. For,

As 975 to 1 ; 975 ⟶ 1

So 500 to 512|8205 500 ⟵ 512|8205

2 *Having any ſumme of ſterling money delivered in* England, *and what rate he is to receive for it, in any forreign Countrey, to finde how much of that Countreys coyne, his is to receive for his ſterling money.*

As 1, to one pound *Flemiſh* ;
So the money delivered, to the ſumme to be received.

So if a Merchant deliver in *London* 375 pounds ſterling, to receive in *Antwerp* 1 pound, 1 ſhilling, 9 pence *Flemiſh*, for every pound ſterling, he muſt receive for his 375 pounds ſterling 407 pounds, 16 ſhillings, 3 pence *Flemiſh*. For,

As 1 to 1,0875 1 ⟶ 1,0875

So 375 to 407|8125 375 ⟵ 407|8125

3 *Having the ſumme delivered, and the ſumme to be abated in the 100, to find how much muſt be received.*

AS the totall of the ſums delivered, and to be abated,
to the ſumme delivered ; So

So the ſumme delivered,
to the ſum to be received.

So if a Merchant deliver in *London* 300 ℔. to be repaid at *York*, at 10 pounds *per Cent.* abate, the totall of the ſums delivered, and to be abated being 330 pounds, it will be found that he ſhall receive at *York* 272 pounds, 14 ſhillings, 6 pence, 2 farthings. For,

As 330 to 300; 330 Z 300

So 300 to 272|7.72 300 272|7272

PROGRESSION.

Progreſſion hath divers appellations according to the divers manners of Progreſſion, if the nnmbers increaſe by 1, as 1, 2, 3, 4, 5, &c. it is called naturall Progreſſion: If they increaſe by 2, as 2,4,6,8,10,&c. it is called Progreſſion by 2: If they increaſe by 3, as 3, 6, 9, 12, 15, &c. it is called Progreſſion by 3; and ſo of others.

It hath divers manners of operation, and ſerves chiefly to find the totall of any Progreſſion without addition. Likewiſe if two Travellers depart from two places, or follow one another from one place, to find in what time they will meet or over-take one another.

1 *Example.*

This example is of naturall progreſſion, wherein adde the firſt and laſt numbers together, & they make 14, the half whereof is 7, by which multiply the laſt number 13, and the Product will be 91. And ſo much theſe 13 numbers amount unto.

Firſt number	1	*Half of*	14	13
Laſt number	13	*is*	7	7
Totall	14	*Product*	91	*and totall.*

2 *Example.*

This example is of Progreſsion by 2, wherein likewiſe adde the firſt and laſt numbers together, and take the half thereof, and by it multiply 9, the numbers in the progreſsion, and the product will be 90, and ſo much do thoſe 9 numbers amount unto.

2
4
6
8
10
12
14
16
18
90

3 *Example.*

This example is of Progreſsion by 3, the firſt and laſt numbers whereof added together, make 35, the halfe whereof is 17½, which multiplyed by 8 the numbers of the Progreſsion, the product will be 140, and ſuch is the ſumme of thoſe eight numbers.

7
10
13
16
19
22
25
28
140

4 *Example.*

A Woollen-draper ſold 100 pieces of Kerſeys after this manner, that is to ſay, the firſt piece for 1 ſhilling, the ſecond for 2 ſhillings, the third for three ſhillings, &c. riſing 1 ſhilling in every piece, according to naturall Progreſsion, The queſtion is, how much he muſt have for his 100 pieces of Kerſeys? Anſwer 252 pounds, 10 ſhilings,

Take the one half of 100, which is 50, then adde the firſt and laſt numbers together, make

101, which multiplyed by 50, and the product 5050, divided by 20 the ſhillings in one pound, the Quotient will be 252|5 in coyn 252 pounds as before.

100 *The Kerſeys ſold.*
50 *Half of them.*

101 *Firſt & laſt numbers added.*
50

5050 *Product.*

x x (0
5050'0 (252|5
20000
222

5 *Example.*

One huudred ſtones are laid in a right line, every ſtone a juſt pace one from another, and 1 pace from the firſt ſtone is ſet a basket to put the ſtones in. The queſtion is how many paces a man muſt go or run to gather up the ſaid ſtones one by one, and put them into the baſket. Anſwer, 10 thouſand and 100 paces, which (if it be granted that 2000 paces makes a mile) is 10 miles, and $\frac{1}{2}$ of a mile.

Here obſerve that to fetch the firſt ſtone he goes 2 paces, for the ſecond 4, for the third 6, and for the fourth 8 paces; So that the laſt term is 200, whereto adde the firſt term 2, makes 202, which multiplyed by 50 half the ſtones, the product will give you the paces, and the product divided by 1000, the quotient is the miles at 1000 paces to the mile.

202 *Firſt, and laſt numbers added together.*
50 *Half the ſtones.*

10100 *Product and paces.*

10|100 *The quotient and miles as before.*

6 Example.

Two meſſengers goe both from one place, the firſt goes every day 8 miles, the ſecond goes the firſt day 1 mile, the ſecond day 2 miles, the third day 3 miles, increaſing his journey every day 1 mile according to naturall Progreſſion. The queſtion is in how many dayes the ſecond ſhall over-take the firſt? Anſwer in 15 dayes.

To work this queſtion, double the firſt meſſengers dayes journey, makes 16, from which ſubſtract 1, the ſecond Meſſengers firſt dayes journey, reſts 15, and in ſo many dayes the ſecond will overtake the firſt.

But if the ſecond Meſſenger had gone the firſt day 2 miles, the ſecond 4, and the third day 6, &c. then he would have over-taken him in 7 dayes. For here obſerve that 8 is the middle and fourth term, therefore either ſubſtract 1 from 8, or double 4, and ſubſtract 1 from it, reſts 7, and in ſo many dayes he will over-take him.

7 Example.

Admit two places A and B be diſtant 80 miles, & that one meſſenger ſetting out from A to-

towards B goes every day 7 miles, another at the ſame inſtant ſets out from B towards A, and goes every day 9 miles; and it were demanded in how many dayes theſe two would meet?

Adde together the miles that each of them goes in one day; and then the proportions are,

As the miles they goe in one day, to 1;
So the diſtance of the places, to the days they will meet.

So if they goe 16 miles in one day, and the diſtance of the places be 80 miles, it will be found that they will meet in 5 dayes. For,

As 16 to 1,
So are 80 to 5.

16 — 1
80 — 5

SIN-

Single POSITION.

THe Rule of ſingle Poſition, or of one falſe Poſition, and likewiſe of two falſe Poſitions, or double Poſition, is more to try the wit, then for any uſe is made of them: for they are in nature of Riddles or hard Queſtions, nevertheleſs, we will give examples in each of them: and firſt in ſingle Poſition, which is generally wrought either by the Rule of Three, wherein the ſuppoſition is one number, the numbers ariſing of the ſuppoſition another, and the number given the third: or by Multiplication and Diviſion.

1 *Example.*

A man paſſing by a maid, keeping a flock of Geeſe, ſaid; God ſpeed fair maid and your 20 Geeſe: No Sir, ſaid ſhe, I have not 20, but if I had as many more, and half as many more, and two Geeſe and a half, then had I twenty. I demand how many Geeſe ſhe had?

Snppoſe 9, then as many more make 18, and half as many more make 22½, and two Geeſe and a half makes 25; now if 25 come of my ſuppoſition 9, what will come of 20?

As

As 25 to 9; 25 Z 9
So are 20 to 7. 20 7
And ſo many Geeſe the maid had.

For proof, adde the maids anſwer together, as 7, and as many more make 14, and half as many more make 17½, and two Geeſe and a half make 20, whereby it appears that ſhe had 7 Geeſe and no more.

2 *Example.*

Admit a Ciſtern which will hold 60 pipes of water hath three unequal Cocks, if the firſt and greateſt be ſet open, and the reſt kept ſhut, all the water will run clean out in one houre; if the ſecond be ſet open, and the reſt ſhut, it will run clean out in two houres; if the third be ſet open, and the reſt ſhut, it will run out in three hours. I demand in what time all the water will run out, if all the three cocks be ſet open together?

Suppoſe it will run out in half an hours time, *viz.* in 30 minutes. Then at the firſt cock muſt run out 30 pipes, at the ſecond 15, and at the third 10, which added together, make but 55, and it ſhould be 60. Now,

As 55 to my ſuppoſition 30 55 Z 30
So are 60 to 32|7272 which 60 32|7272
is 32 minutes, and 43 ſeconds, and in that time all the water will run out, if all the Cocks be ſet open at once.

3 *Ex-*

3 *Example.*

A Merchant delivered to a Banker, a summe of money unknown, to pay him *per Annum* 6 pounds use *per Cent.* And at the end of 10 years he paid him 300 pounds for all both principall and use. I demand how much the principall was?

Suppose the principall was 100 pounds, whereto adde the 10 years use at the rate proposed makes 160 pounds. Then,

As 160 to 100 160 Z 100

So are 300 to 187|5 And 300 Z 187|5

so much was the principall.

4 *Example.*

Three Merchants bought a parcell of Cloves for 575 pounds 16 shill. whereof the first must pay a summe unknown, the second twice as much as the first; and the third 4 times as much as the second. The question is how much every Merchant must pay?

Suppose the first must pay 1 pound, then the second must pay 2 pounds, and the third 8 pounds, which added together, make 11, whereby divide 575|8, and the quotient will give the summe the first Merchant must pay. Then,

As 1, to that Quotient;

So is 2, to the part the second Merchant must pay.

So

So the quotient being 52|345454, the part the second Merchant is to pay will be found to be 104 pounds, 13 shillings, 9 pence 3 farthings. For,

As 1 to 52|345454 1 Z 52|345454
So 2 to 104|690908 2 104|690908

As 1 to the Quotient;
So 8, to the part the third Merchant must pay;

So the quotient being 52|345454, the part the third Merchant is to pay will be found to be 418 pounds, 15 shillings, 3 pence, 1 farthing. For,

As 1 to 52|345454 1 Z 52|345454
So 8 to 418|763632 8 418|763632

5 *Example.*

A square is propounded, conteining 154 feet and a Circle desired to be described equall to it: what may the length of the Diameter be?

Suppose 7 feet, then the Circumference must be 22 feet, and the *Area* 38½.

Multiply the supposed Diameter 7 by it self, makes 49, which again multiply by 11, & divide that

that product by 14, & the Quotient wil be the *Area*. Then by this *Area* or Quotient divide 154, and the Quotient will be 4, whereof take the square root, and multiply it by 7 the supposed Diameter, and the product thereof will be the Diameter required.

```
 7                 49          ~~1~~~~1~~~~7~~(0
 7                 11          ~~5~~~~3~~~~9~~|~~0~~(38|5 area
49 (1 Product.     49          ~~1~~~~4~~~~4~~
                   49            ~~1~~~~1~~
                  539 2(Products.
                  (0
                154|0(4          4(2 Square root.
                385                ~~2~~
                                2
                                7
                               14 the Diameter required
```

DOV-

Double POSITION.

AS in ſingle Poſition they make but one ſuppoſition; ſo in this Rule they make two, and place their firſt errour under their firſt ſuppoſition, and their ſecond errour under their ſecond ſuppoſition. Then if both errours be alike, that is both too great, or both too little, they ſubſtract the leſſer from the greater, and the remainer is the Diviſor; but if the errours be unlike, that is, if one be too great, and the other too little, then they adde them together, and the totall is the Diviſor, according to the verſes,

The ſignes both like, Subſtraction do require:
But unlike ſignes Addition do deſire.

Then they multiply the errours croſſe-wiſe, *viz.* the ſecond errour by the firſt ſuppoſition, and the firſt errour by the ſecond ſuppoſition, and if both the errours be alike, that is both too great, or both too little they ſubſtract the one from the other, and the remainer is the dividend, and the quotient the anſwer. But if the errours be unlike, that is one too great, and the other too little, then they adde the products together, and the totall is the dividend, and the quotient is the anſwer, as before.

1 *Ex-*

Two men have each of them a certain ſumme of money, but how much is unknown. Saith one to the other, give me one penny from thee and I ſhall have as much as thou; Not ſo ſaith the ſecond man, but give me one penny from thee, & I ſhal have twice as much as thou haſt: The queſtion is how much each of them had?

Suppoſe the firſt man had 3 pence, and receiving one penny from the ſecond man, he hath 4 pence: ſo by this ſuppoſition the ſecond man had 5 pence, and parting from one penny to the firſt man, one had as much as the other, *viz.* 4 pence a piece.

Now if the firſt man give one penny to the ſecond, then he will have but 2 pence left, and the ſecond man will have 6 pence, which is thrice as much as the firſt, and it ſhould be but twice as much, wherefore ſubſtract 4 from 6, reſts 2, my firſt errour too great.

Again, ſuppoſe the firſt man had 6 pence, and receiving 1 penny from the ſecond he hath 7 pence; ſo that by this ſuppoſition the ſecond man had 8 pence, and parting from one penny, they have 7 pence a piece. But if the firſt man give 1 penny to the ſecond, then he will have 5 pence left, and the ſecond man will have 9 pence, which is not twice as much as the firſt man hath left by 1 penny, for 5 pence is the half of 10 pence, wherefore ſubſtract 9 pence from 10 pence, reſts 1 penny, my 2d. errour too little.

Now

Now having found the errours, and placed them under the ſuppoſitions, as isbefore taught and as in the figure here under appeareth, multiply them croſs-wiſe, namely the firſt errour 2 by the ſecond ſuppoſition 6; and 1 the ſecond errour by 3 the firſt ſuppoſition, and the products added together (becauſe the errours are unlike, that is, one too great, and the other too little) the totall is the dividend, and for the ſame reaſon, adde the errours together, and the totall is the Diviſor, and the Quotient the money the firſt man had.

Firſt errour	2	
And the ſecond errour	1	
Added together make	3	*the Diviſor.*

Second ſuppoſition		6
Multiplyed by the firſt errour		2
The product is		12

Firſt ſuppoſition		3
Multiplyed by the ſecond errour		1
The product is		3

Firſt product	12	
Second product	3	
Added together make	15	*the Dividend.*

Firſt,

15

First supposition 3 6 second supposition.

First errour too great. 2 1 second errour too little.

3

~~1~~5(5 So much money namely 5 pence, the
3 first man had, and so the second must have 7 pence. So if the first man give the second 1 penny, then he will have 8 pence which is just twice as much as the first man hath left: And if the second man give the first 1 penny, then he will have just as much as the second man hath left, namely 6 pence.

2 *Example.*

A Thresher having threshed 82 quarters, and $\frac{3}{4}$ of a quarter of Corn, part wheat, and part barley, forgot how many quarters of each, but well remembred that he received for all his work 5 pounds, 1 shilling, 2 pence, 1 farthing after the rate of 1 shilling, 3 pence, 2 farthings for every quarter of wheat, and 11 pence 3 farthings for the quarter of barley. The question is how many quarters of either grain there were thresh'd.

Set down the whole summe the thresher received in artificiall numbers, and likewise the

price of threſhing 1 quarter of wheat, and 1 quarter of barley ſeverally; and by the firſt ſuppoſition, multiply the price 1 quarter of wheat coſt threſhing; that done, ſubſtract the firſt ſuppoſition from the totall of all the Corn threſh'd, and by the remainer multiply the price for threſhing one quarter of barley, then adde the products together, and ſubſtract the totall from the whole price of threſhing all the Corn both wheat and barley, and the remainer is the firſt errour.

But if the totall of thoſe products added together be greater then the totall of the whole price for threſhing all the Corn both wheat and barley, then ſubſtract the price out of the totall of the products, and the remainer is the errour.

In like manner work the ſecond ſuppoſition.

5059376 The money for threſhing all the corn

064584 The price for threſhing 1 q. of wheat

048959 The price for threſhing 1 q. of barley

First I ſuppoſe there were 44 quarters of wheat, by which I multiply the price of threſhing 1 quarter of wheat.

	064584
	44
	258336
	258336
And the product is	2841696

Then

Then I ſubſtract my firſt ſuppoſition 44 from 82|75, the whole Corne threſh'd, and there remains 38|75

By this remainer 38|75 I multiply 048950 the price for threſhing 1 quarter of barley,&

82 | 75	
44 | 00	
38 | 75	
048950	
38|75	
244795	
34 7 13	
3916 2	
14687 7	

the product is 1|897161125

The product of the wheat 2|841696

The product of the barley 1|897161125

Added together make 4|738857125 which being ſubſtracted from 5|059376

there remaines 0|320517 75 my firſt errour too little.

Secondly, I ſuppoſe there were 50 quarters and a half of wheat, by which I multiply the price of threſhing one quarter of wheat,

064584	
50|5	
322920	
3229200	

the product is 3|261492 0

Then as before, I ſubſtract my ſecond ſuppoſition 50|5 from 82|75, & there remains

82|75
50|5
32|25

By this remainer 32|25 I multiply the price of threſhing one quarter of barley, and

048959
32|25
244795
97918
97918
146877

the product is 1|57892775

Next I adde together the laſt product of the wheat, 3|2614920

And the laſt product of the barley 1|5789275

And their totall is 4|84041975

which ſubſtracted from 5|0 9376

there remains 0|21095625
my ſecond errour too little.

This

This done I multiply my first errour by my second supposition,

```
 32051875
      50|5
---------
 160259375
1602593750
---------
```

and the product is 16|186196875

Then I multiply my second errour by my first supposition 44

```
 21895625
       44
---------
 87582500
87582500
---------
```

and the product is 9|63407500

And because both the errours are alike, that is both too little, I substract the second Product 9|63407500

from the first 16|186196875

And there remaines 6|552121875 *Dividend*

Then from my first errour 32051875

I substract my second 21895625

And there remains 10156250 *Divisor.*

6|552121875

First supposition. 44

50|5 2d. supposition.

First 32051875 errour too little.

21895625 Secód errour too little.

10156250

|184
262|
40837|068
65|5212187|5 (64|5
10156250000
10156255
101562

So many quarters of wheat there were thresh ed. Then,

Substract the quarters of wheat 64|5

from the totall thresh'd 82|75

And the remainer is 18|25 And so many quarters of barley were threshed.

There is another way to work this last example, namely by having the just quantity of wheat and barley threshed first given, and so there will be no remainer, but then the question is begg'd, therefore I follow it not, and the remainer here is so small, it is not considerable.

OF

Of taking DISTANCES *at one* STATION.

TO finde a diſtance at two ſtations by knowing the difference of the ſame ſtation, hath been long ſince invented and publiſhed, and the proportions for the ſame according to Mr *Gunter* are.

As the difference of ſegments on the ſtaffe,
Unto the difference of ſtations
So is the whole ſegment,
Unto the diſtance.

But to finde a diſtance at one ſtation, is an Art never till of late invented, and never heretofore publiſhed.

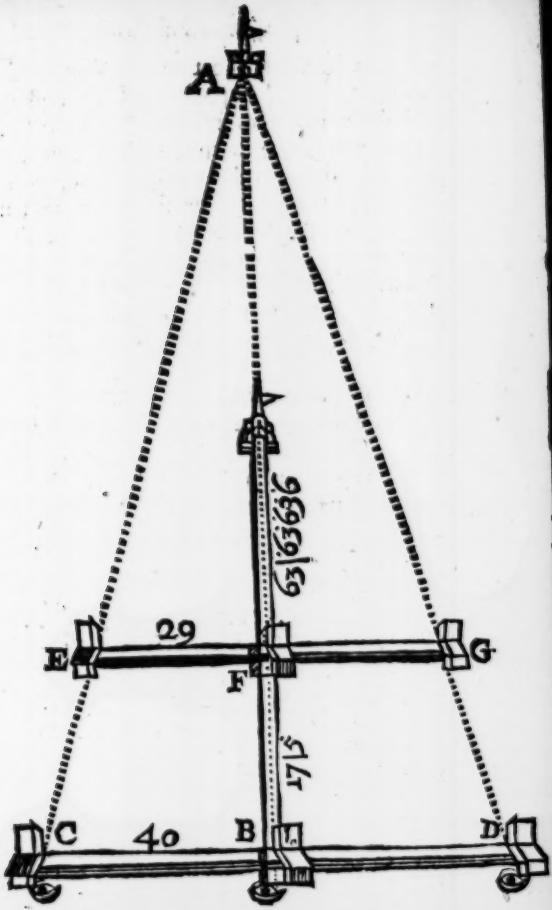
The Inſtrument we uſe herin is no other then M. *Gunters* ſtaffe, ſave that where he hath but one Croſſe we have two, and inſtead of the Horizontall ſight, we uſe a needle with a ſmall bead upon it, placed in ſuch ſort, that the viſuall line paſſing along the middle of the ſtaffe

ſtaffe, may cut that bead, and the marke propoſed in the middeſt, with which, and at the ſame place, namely in the middeſt of the mark propoſed; whether Tree, Tower, Caſtle, or ought elſe the viſuall lines paſſing by the outward ſights may meet, as in the following demonſtration appeareth.

1 *To finde a diſtance at one ſtation.*

SEt one of the Croſſes unto which end of the ſtaffe you pleaſe, but rather at the beginning of the inches, and the other Croſſe at any diſtance leſſe or more from it, then having fixed the ſtaffe ſo, that it may be kept ſteady and level, place the outward ſight of the Croſſe at the end of the ſtaffe, at ſuch a convenient number of inches from the middle of the ſtaffe, as you conceive to be meeteſt to find the diſtance required. As if it be 2 inches from the middle of the ſtaffe, to the outward ſight on the croſſe then the whole Croſſe between the two ſights will be 4 inches, or if you reckon every inch for a foot or a pace, it wil be 4 feet or 4 paces; if for 10 inches, feet, or paces, it will be 40 inches, feet or paces.

This done, place your other Croſſe ſo, as there may be 2, 4, 8, 10, 12, or 20 inches, or more or leſſe, as you ſee good, intercepted on the


A
63|63|63|6
29
E
F
G
17|5
C
40
B
D

the staffe between the two Crosses, and so keeping it, draw the upper Crosse in and out, untill the visuall lines from the outward sights on the Crosse, meet with the visuall line from the middle sights in the Castle, Tree, Tower, or Marke proposed. Then substract the lesser Crosse from the greater, and note the difference. For,

As that difference,
Unto the greater Crosse;
So the distance intercepted between the two Crosses,
Unto the whole distance.

So the difference between the two Crosses E G and C D, being 11 paces, and the distance F B intercepted on the staffe between the two Crosses 17 paces and a half, the whole distance A B will be found to be 63 paces, and 3 feet. For,

As 11 to 40; 11 — 40
So are 17|5 to 63|03636 — 17|5 — 63|63636

2 *To finde the distance of a Rock, Sand, Cape, or Headland from the Ship at Sea.*

SUppose that being at Sea, I espy a Headland, or Cape, and would know how far it is off, setting

ſetting one of the Croſſes unto the end of the ſtaffe, as is before directed, I place the outward ſight thereof at 10 inches from the middle of the ſtaffe, ſo the whole Croſſe between the two ſights is 20 inches, which I reckon for 200 paces, then I place the other Croſſe at 27 inches from the end of the ſtaffe, and there keeping it fixt, I draw the upper Croſſe in and out, untill the viſuall lines paſſing by the outward ſights, and the middle of the ſtaffe meet in the Cape, and then finding the upper Croſſe to contein between the two ſights 18 inches, and $\frac{8}{10}$ of an inch (which I account for 188 paces) I ſubſtract it from the greater Croſſe, and the remainer is 12 paces: Then,

As 12 to 200, 12 ~ 200
So are 270 to 4500. 270 ∠ 4500

And ſuch is the diſtance of that Cape from the ſhip, namely, 4500 paces; The bearing whereof being found by the Compaſſe at the ſame time, and having my Latitude and Longitude, I may put it down in my plot, according to his true Latitude, Longitude, Diſtance and bearing.

3 *To finde any ſide of a Square piece of land the perpendicular and ſides of any Triangle, and the Diameter of any Circle in any plain land.*

THis Propoſition may be of good uſe to Land-meaſurers, to ſave them a labour to meaſure plain land by Rods, or Chains.

As, ſuppoſe, I was to meaſure a ſquare plain field: Firſt at one end thereof, I ſet up a ſtaffe with a large Card or piece of paſtboard upon it dyed or painted red, and made with a ſocket to move up & down upon the ſtaff at pleaſure, then ſtanding at the other end of the field, or (if it be ſo long that I cannot perfectly diſcern that mark) in the midle of it, or ſo neer that I may diſcern it, I fix or hold my Inſtrument or ſtaff level, and cauſe the Card to be moved up and down, till it be levell with my Inſtrument. The greater Croſſe I place 5 inches from the middle of the ſtaffe, ſo that Croſſe between the two ſights will be 10 inches, then I ſet the other Croſſe 11 inches on the ſtaffe from it, and drawing it it in and out, untill the viſuall lines meet in the Card; I find that Croſſe between the two ſights to be 8 inches and $\frac{6}{10}$; which ſubſtracted from the greater Croſſe, reſts 1 inch and $\frac{4}{10}$, which I reckon for 1 Rod, or Perch and 4 parts of

of a Rod divided into 10 parts, accounting every inch for a Rod. Then,

As 1.4 to 10; 1.4 Z 10
So are 11 to 78.5714 11 Z 78.5714

Thus the ſide of that field is found to be 78 perches, 9 feet, and almoſt a half long.

4 *To make a perfect ſhot in any Morter-peece.*

IN beſieging a Town Caſtle or other Fort, it may often fall out that the Canoneer cannot take a diſtance at two ſtations but muſt be endangered by the enemies ſhot, and to make a perfect ſhot it is requiſite for him to know both how farre his Peece will ſhoot or carry a bullet or ball of fireworke at the beſt of her randon; As alſo how farre it is from his peece to the mark hee intends to ſhoot at, which being known, he may make a perfect ſhot, and to find it ſerves this invention. Therfore of excellēt uſe is it for the ſafety of the Canoneer: For ſuppoſe, ſtanding by his Peece within the works he levels his ſtaffe even with the Caſtle, or what place he thinks moſt convenient for his purpoſe, and when the viſuall lines meet in the mark, having upon the greater Croſſe 7 inches between the two ſights which he

he accounts for 7, between the two ſights of the leſſer Croſſe 5 inches, which he reckons for 50 paces, and 9 inches intercepted on the ſtaffe for 90 paces, the diſtance between the piece and mark will be found to be 315 paces. For according to the Rule of Three Direct.

As 20 paces the difference between the two Croſſes,
to 70 paces, the greater Croſſe;
So are 90 paces the diſtance intercepted on the ſtaffe,
to 315 paces, the diſtance required.

So if this Morter peece at the beſt of the Randon will ſhoot a bullet or fire-worke 500 paces, and the mark he intends to ſhoot at is found to be but 315 paces from his peece, he muſt lay it at 71 degrees and a half of the quadrant almoſt, to make a good ſhot at this diſtance. For according to the Backward Rule of Three

As 315 to 500; 45 Z 500
So are 45 to 71|4280. 315 71|4280

Many more uſes may be made thereof, but to the ingenious, theſe may be ſufficient.

FINIS.